

**SEARCH REQUEST FORM**

Scientific and Technical Information Center

Requester's Full Name: KRISHNAN MENON Examiner #: 79533 Date: 10/5/03  
Art Unit: 1723 Phone Number 30 5-5999 Serial Number: 09/914704  
Mail Box and Bldg/Room Location: C3 SC14 Results Format Preferred (circle): PAPER DISK E-MAIL

**If more than one search is submitted, please prioritize searches in order of need.**

\*\*\*\*\*

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: Sulfonated aromatic polymer, membranes, method of production  
Inventors (please provide full names): Alexander Dyck et al

Earliest Priority Filing Date: Aug 31 2000

*\*For Sequence Searches Only\* Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.*

Structure search for claims

1, 2, and 19-44

List of claims attached.

\*\*\*\*\*

**STAFF USE ONLY****Type of Search****Vendors and cost where applicable**Searcher: EL

NA Sequence (#) \_\_\_\_\_

STN

\$ 225.51

Searcher Phone #: \_\_\_\_\_

AA Sequence (#) \_\_\_\_\_

Dialog

Searcher Location: \_\_\_\_\_

Structure (#) ✓ (3)Questel/Orbit

Date Searcher Picked Up: \_\_\_\_\_

Bibliographic ✓ (and)

Dr. Link

Date Completed: 10-7-03

Litigation \_\_\_\_\_

Lexis/Nexis

Searcher Prep & Review Time: 10

Fulltext \_\_\_\_\_

Sequence Systems

Clerical Prep Time: \_\_\_\_\_

Patent Family \_\_\_\_\_

WWW/Internet

Online Time: 80

Other \_\_\_\_\_

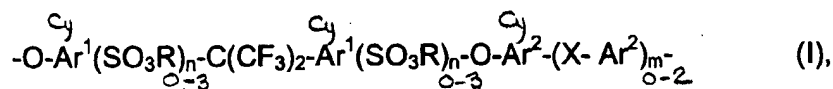
Other (specify) \_\_\_\_\_

99/F 044

19

## Patent claims

1. A sulfonated aromatic polymer comprising the repeating structural unit of the formula (I)



in which  $\text{Ar}^1$  and  $\text{Ar}^2$  are, independently of one another, divalent aromatic or heteroaromatic radicals which are optionally substituted by one or more monovalent organic groups which are inert under the conditions of use or sulfonic acid groups, R is hydrogen, an alkali metal or alkaline earth metal ion or an ammonium ion, n is an integer from 0 to 3, m is 0, 1 or 2 and X is a  $\text{-CO-}$ ,  $\text{-O-}$ ,  $\text{-C}_p\text{H}_{2p-}$ ,  $\text{-C}_p\text{F}_{2p-}$  or  $\text{-S-}$  group, in which p is an integer from 1 to 10.

2. A sulfonated aromatic polymer as claimed in claim 1, which, besides the repeating structural unit of the formula I, comprises the repeating structural unit of the formula II



in which  $\text{Ar}^1$ ,  $\text{Ar}^2$ , R, m and n have the meaning defined in claim 1, and Y is a  $\text{-CO-}$ ,  $\text{-O-}$ ,  $\text{-C}_p\text{H}_{2p-}$ ,  $\text{-C}_p\text{F}_{2p-}$ ,  $\text{-S-}$  or  $\text{-SO}_2\text{-}$  group in which p is an integer from 1 to 10.

3. A sulfonated aromatic polymer as claimed in either of claims 1 or 2, wherein X is  $\text{-CO-}$ .

4. A sulfonated aromatic polymer as claimed in either of claims 1 or 2, wherein  $\text{Ar}^1$  and  $\text{Ar}^2$  are, independently of one another, phenylene, naphthylene and/or biphenylene, in particular 1,3- and/or 1,4-phenylene.

0909/9147042302

518 PCT/PTO 31 AUG 2001

1999/F 044 (8577\*38)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: ALEXANDER DYCK *ET AL.*

SERIAL NO. TO BE ASSIGNED

FILED: HERewith

FOR: SULFONATED AROMATIC POLYMERS,  
MEMBRANE CONTAINING SAID  
POLYMERS AND A METHOD FOR THE  
PRODUCTION AND USE OF THE SAME

ART UNIT: TO BE ASSIGNED

EXAMINER: TO BE ASSIGNED

Asst. Commissioner for Patents  
Washington, D.C. 20231

"EXPRESS MAIL" No. EJ 375994391 US DATE: AUGUST 31, 2001

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*Carrie A. McPherson*  
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PRELIMINARY AMENDMENT

Sir:

Prior to fee calculation and examination please amend the above-identified application as follows.

In the Claims

Please cancel claims 3-18.

Please add the following new claims.

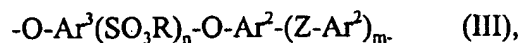
- 19. The sulfonated aromatic polymer as claimed in claim 1, wherein X is -CO-.
20. The sulfonated aromatic polymer as claimed in claim 1, wherein Ar<sup>1</sup> and Ar<sup>2</sup> are, independently of one another, phenylene, naphthylene or biphenylene.
21. The sulfonated aromatic polymer as claimed in claim 1, which further comprises the

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8-7-02

A'

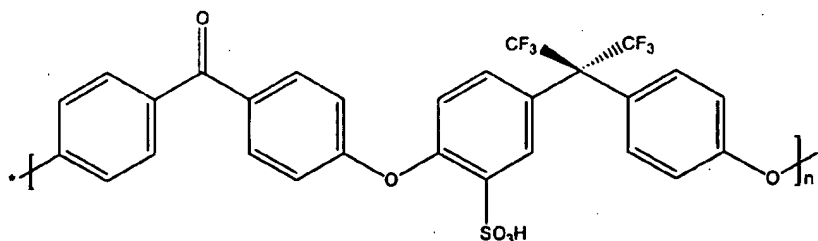
1999/F 044 (8577\*38)

repeating structural unit of the formula III



in which  $Ar^2$ ,  $R$ ,  $m$  and  $n$  have the meaning defined in claim 1,  $Z$  is a  $-CO-$ ,  $-O-$ ,  $-C_pH_{2p}-$ ,  $-C_pF_{2p}-$ ,  $-S-$  or  $-SO_2-$  group in which  $p$  is an integer from 1 to 10, and  $Ar^3$  is a divalent aromatic or heteroaromatic radical which is optionally substituted by one or more monovalent organic groups which are inert under the conditions of use.

22. The sulfonated aromatic polymer as claimed in claim 21, wherein the molar proportion of the repeating structural unit of the formula I is 10-50% and the molar proportion of the repeating structural unit of the formula III is 90-50%.
23. The sulfonated aromatic polymer as claimed in claim 1, which consists essentially of the repeating structural unit of the following formula:



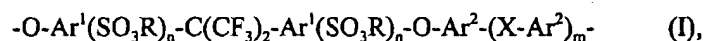
24. The sulfonated polymer as claimed in claim 1, which has an ion exchange capacity of between 0.5 and 3.0 meq  $(-SO_3H)/g$  of polymer.
25. A membrane comprising the sulfonated polymer as claimed in claim 1.
26. The membrane as claimed in claim 25, which has a proton conductivity in contact with

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liquid water, determined by impedance spectroscopy in water at 80°C, of between 120 and 350 mS/cm.

27. The membrane as claimed in claim 25, which comprises as further polymer component a sulfonated, aminated or else underivatized aromatic polymer.
28. The membrane as claimed in claim 25, which has a thickness of between 10 and 150  $\mu\text{m}$ .
29. A method for producing a membrane as claimed in claim 25, comprising the steps of:

- (i) dissolving a sulfonated aromatic polymer comprising the repeating structural unit of the formula (I) or its salt form,



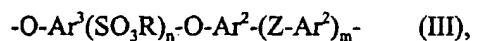
in which  $\text{Ar}^1$  and  $\text{Ar}^2$  are, independently of one another, divalent aromatic or heteroaromatic radicals which are optionally substituted by one or more monovalent organic groups which are inert under the conditions of use or sulfonic acid groups, R is hydrogen, an alkali metal or alkaline earth metal ion or an ammonium ion, n is an integer from 0 to 3, m is 0, 1 or 2 and X is a  $-\text{CO}-$ ,  $-\text{O}-$ ,  $-\text{C}_p\text{H}_{2p}-$ ,  $-\text{C}_p\text{F}_{2p}-$  or  $-\text{S}-$  group, in which p is an integer from 1 to 10,

in an aprotic organic solvent,

- (ii) spreading the solution on a support, and
  - (iii) evaporating the solvent to form the membrane.
30. The method for producing a membrane as claimed in claim 29, wherein the solution is DMF, DMAC, NMP or DMSO and said polymer has a concentration being between 3 and 30% by weight.

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31. The method for producing a membrane as claimed in claim 29, wherein the salt forms of the polymer are employed and wherein the salt forms can be converted into the acid form by treatment with an acid after production of the membrane.
32. The method for producing a membrane as claimed in claim 29, wherein the remaining solvent or salts are removed after the membrane production by a washing medium.
33. The sulfonated aromatic polymer as claimed in claim 2, wherein  $Ar^1$  and  $Ar^2$  are, independently of one another, 1,3-phenylene or 1,4-phenylene.
34. The sulfonated aromatic polymer as claimed in claim 1, wherein  $Ar^1$  and  $Ar^2$  are, independently of one another, 1,3-phenylene or 1,4-phenylene.
35. The sulfonated aromatic polymer as claimed in claim 2, which further comprises the repeating structural unit of the formula III



in which  $Ar^2$  is a divalent aromatic or heteroaromatic radicals which is optionally substituted by one or more monovalent organic groups which are inert under the conditions of use or sulfonic acid groups,

R is hydrogen, an alkali metal or alkaline earth metal ion or an ammonium ion,

n is an integer from 0 to 3,

m is 0, 1 or 2,

Z is a  $-CO-$ ,  $-O-$ ,  $-C_pH_{2p}-$ ,  $-C_pF_{2p}-$ ,  $-S-$  or  $-SO_2-$  group in which p is an integer from 1 to 10, and  $Ar^3$  is a divalent aromatic or heteroaromatic radical which is optionally substituted by one or more monovalent organic groups which are inert under the conditions of use.

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36. The sulfonated aromatic polymer as claimed in claim 35, wherein the molar proportion of the repeating structural unit of the formula I and formula II is 10-50% and the molar proportion of the repeating structural unit of the formula III is 90-50%.
37. The sulfonated polymer as claimed in claim 36, which has an ion exchange capacity of between 1.0 and 2.0 meq (-SO<sub>3</sub>H)/g of polymer.
38. The membrane as claimed in claim 25, which comprises as further polymer a polyether sulfone, polysulfone, polybenzimidazole or polyether ketone and the membrane has a thickness of between 20 and 60  $\mu$ m.
39. The membrane as claimed in claim 31, wherein said salt forms of the polymer are NH<sub>4</sub>, Li, Na or K salts.
40. The method as claimed in claim 32, wherein said washing medium is a 5% strength mineral acid in water.
41. A fuel cell which comprises the membrane as claimed in claim 25.
42. The fuel cell as claimed in claim 41, wherein the fuel cell is a direct methanol fuel cell.
43. A high-performance capacitor which comprises the membrane as claimed in claim 25.
44. A dialysis apparatus which comprises the membrane as claimed in claim 25. - -

#### REMARKS

The applicants respectfully request that the preliminary amendment be entered prior to fee calculation and examination. Support for newly added claims 19-32 can be found in the original claims 3-16 respectively. The applicants have rewritten these claims in the proper US form and

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FILE 'REGISTRY' ENTERED AT 12:33:59 ON 07 OCT 2003  
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L2 STR

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L4 STR L1  
L5 SCR 1796  
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L7 1 S L4 AND L3 AND L5  
L8 50 S L1 AND L3  
L9 7787 S L1 AND L3 FUL  
SAV TEM L9 MEN704/A  
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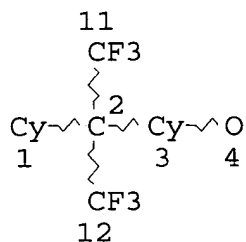
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L14 7 S L11  
L15 18 S (L9/D OR L9/DP) (3A) (?SULFONAT? OR ?SULPHONAT?)  
L16 29 S (L9/D OR L9/DP) (L) (?SULFONAT? OR ?SULPHONAT?)  
L17 682926 S MEMBRAN?  
L18 111422 S DIALY? OR FUELCELL? OR FUEL? (2A) (CELL OR CELLS)  
L19 20 S L16 AND (L17 OR L18)  
L20 22 S (L15 OR L19) NOT L14  
L21 6 S L16 NOT (L14 OR L20)

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GGCAT IS UNS AT 1

GGCAT IS UNS AT 3

DEFAULT ECLEVEL IS LIMITED

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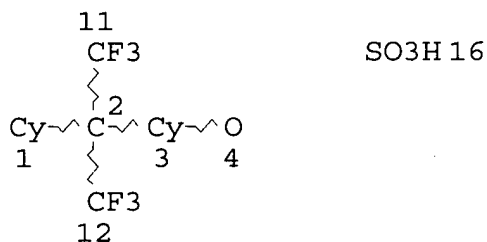
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L4 STR



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DEFAULT ECLEVEL IS LIMITED

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L5 SCR 1796

L9 7787 SEA FILE=REGISTRY SSS FUL L1 AND L3

L11 9 SEA FILE=REGISTRY SUB=L9 SSS FUL L4 AND L3 AND L5

100.0% PROCESSED 60 ITERATIONS

9 ANSWERS

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L14 ANSWER 1 OF 7 ZCAPLUS COPYRIGHT 2003 ACS on STN

2003:667504 Document No. 139:181229 Polyimide membrane for gas separation and manufacture of the membrane. Okamoto, Kenichi; Hirano, Tetsuji (Ube Industries, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2003236352 A2 20030826, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2002-38617 20020215.

AB The membrane has an arom. polyimide-derived imide backbone and mol.-level pores as a result of removal of substituents from the polyimide, which is used as a mol. sieve for gas sepn. The membrane is manufd. from an arom. polyimide film substituted with groups leaving by thermal decompn. by heating for removal of the groups. Thus, 8:2:10 (mol) 2,2'-benzidinedisulfonic acid Et3N salt-9,9-bis(4-aminophenyl)fluorene-1,4,5,8-naphthalenetetracarboxylic dianhydride copolymer was cast to give a film, which was H-exchanged and heated in N at 450.degree. for 1.5 h to give a film showing CO2 permeability 420 .times. 10-10 cm3(STP)cm/cm2-s-cmHg.

IT 581779-72-8DP, proton-exchanged, decompd.

581779-75-1DP, proton-exchanged, decompd.

(arom. polyimide membrane as mol. sieve for gas sepn. manufd. by thermal decompn. for removal of substituents)

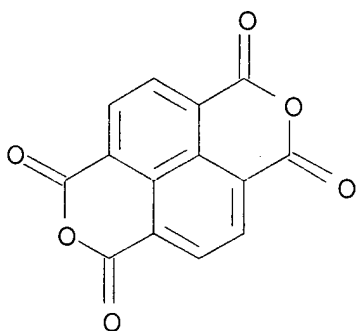
RN 581779-72-8 ZCAPLUS

CN Benzenesulfonic acid, 3,3'-[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis[6-(4-aminophenoxy)-, compd. with N,N-diethylethanamine (1:2), polymer with [2]benzopyrano[6,5,4-def][2]benzopyran-1,3,6,8-tetrone (9CI) (CA INDEX NAME)

CM 1

CRN 81-30-1

CMF C14 H4 O6



CM 2

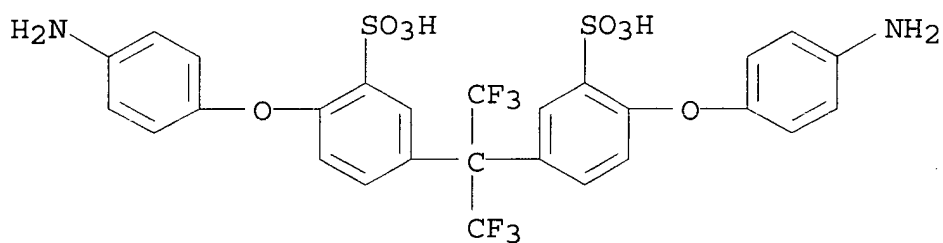
CRN 581779-71-7

CMF C27 H20 F6 N2 O8 S2 . 2 C6 H15 N

CM 3

CRN 444075-04-1

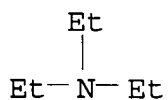
CMF C27 H20 F6 N2 O8 S2



CM 4

CRN 121-44-8

CMF C6 H15 N



RN 581779-75-1 ZCAPLUS

CN Poly[(1,3,6,8-tetrahydro-1,3,6,8-tetraoxobenzo[lmn][3,8]phenanthroline-2,7-diyl)-1,4-phenyleneoxy(2-sulfo-1,4-phenylene)[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene](3-sulfo-1,4-phenylene)oxy-1,4-

phenylene compd. with N,N-diethylethanamine (1:2)] (9CI) (CA INDEX NAME)

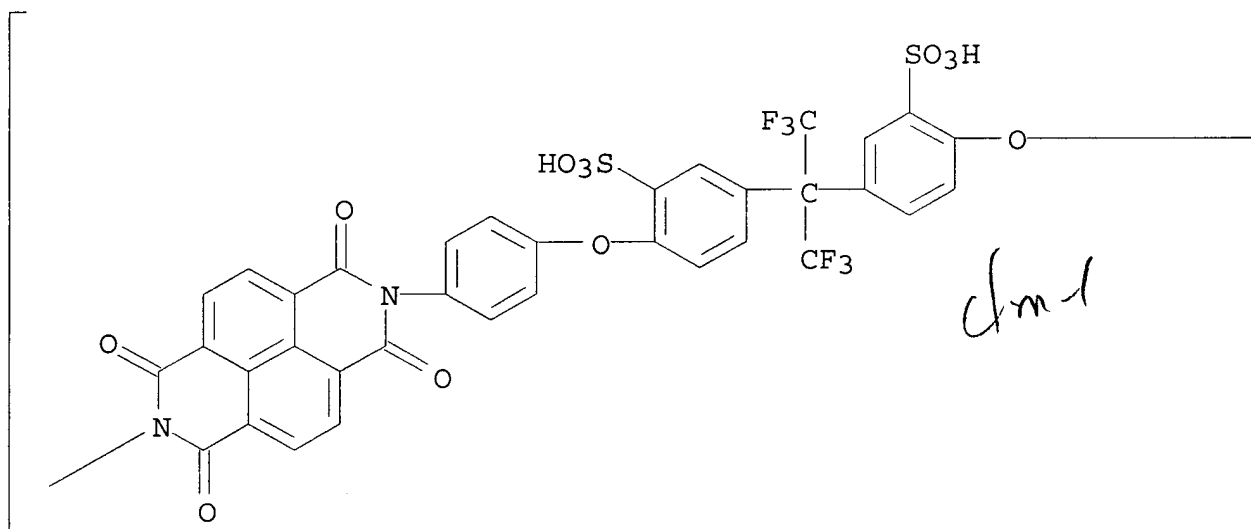
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CRN 444075-06-3

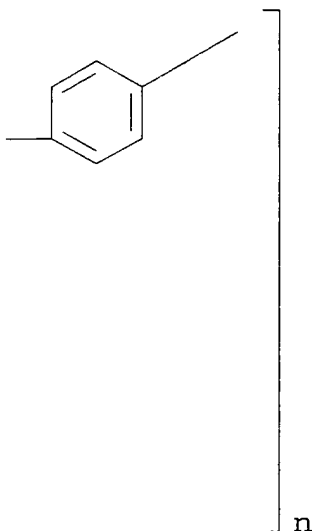
CMF (C41 H20 F6 N2 O12 S2)n

CCI PMS

PAGE 1-A

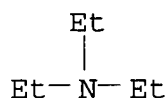


PAGE 1-B



CM 2

CRN 121-44-8  
CMF C6 H15 N



IC ICM B01D071-64  
ICS B01D071-02  
CC 38-3 (Plastics Fabrication and Uses)  
IT 481001-37-0DP, proton-exchanged, decompd. 481001-41-6DP, proton-exchanged, decompd. 500783-35-7DP, proton-exchanged, decompd. **581779-72-8DP**, proton-exchanged, decompd. 581779-74-0DP, proton-exchanged, decompd. **581779-75-1DP**, proton-exchanged, decompd. 581779-77-3DP, decompd. (arom. polyimide membrane as mol. sieve for gas sepn. manufd. by thermal decompn. for removal of substituents)

L14 ANSWER 2 OF 7 ZCAPLUS COPYRIGHT 2003 ACS on STN  
2002:370680 Document No. 137:125983 Gas permeation properties of flexible pyrolytic membranes from sulfonated polyimides. Zhou, Weiliang; Watari, Tatsuya; Kita, Hidetoshi; Okamoto, Ken-Ichi (Department of Advanced Materials Science and Engineering, Faculty of Engineering, Yamaguchi University, Yamaguchi, 755, Japan). Chemistry Letters (5), 534-535 (English) 2002. CODEN: CMLTAG.

ISSN: 0366-7022. Publisher: Chemical Society of Japan.

AB Polyimides were prepd. from dianhydride with planar structure and Cardo-type or bulky-group-contg. [-C(CF<sub>3</sub>)<sub>2</sub>-] diamines. Dense and flexible flat membranes produced by the pyrolysis at relatively low temp. displayed high sepn. performance for C<sub>3</sub>H<sub>6</sub>/C<sub>3</sub>H<sub>8</sub> and CO<sub>2</sub>/N<sub>2</sub> gas pairs.

IT 444075-05-2 444075-06-3

(gas permeation properties of flexible pyrolytic membranes from sulfonated polyimides)

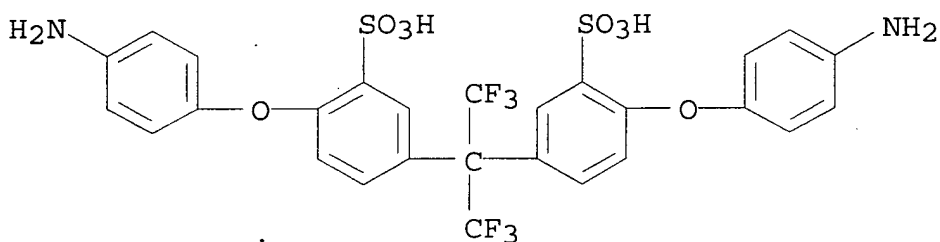
RN 444075-05-2 ZCAPLUS

CN Benzenesulfonic acid, 3,3'-[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis[6-(4-aminophenoxy)-, polymer with [2]benzopyrano[6,5,4-def][2]benzopyran-1,3,6,8-tetrone (9CI) (CA INDEX NAME)

CM 1

CRN 444075-04-1

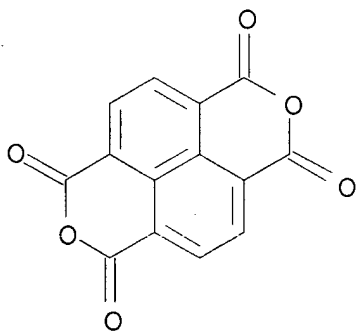
CMF C27 H20 F6 N2 O8 S2



CM 2

CRN 81-30-1

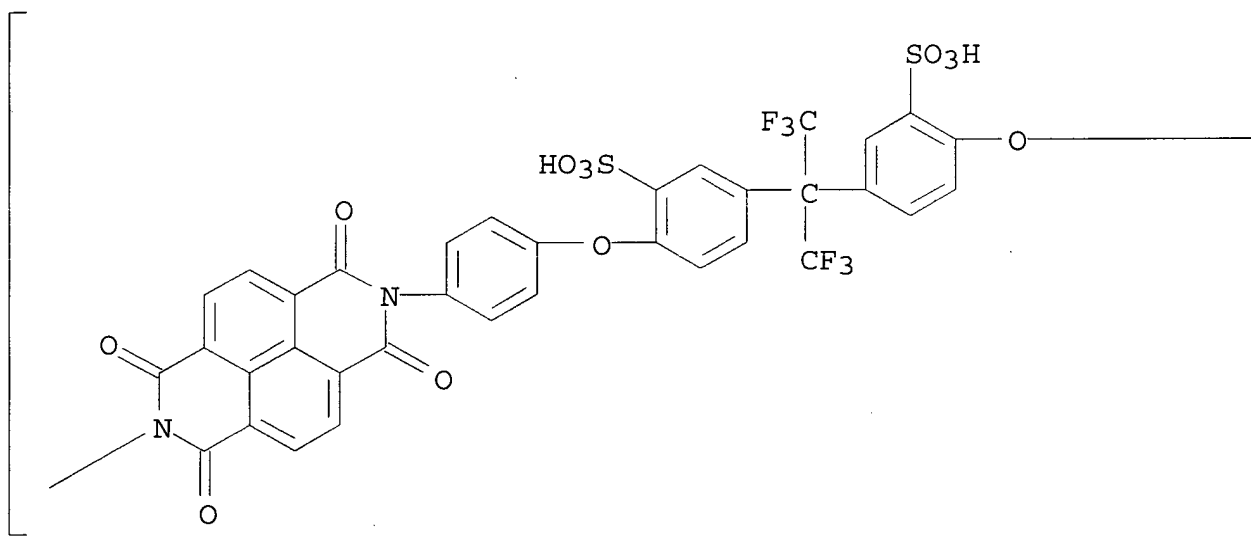
CMF C14 H4 O6



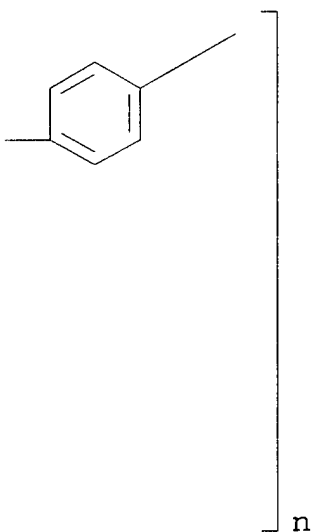
RN 444075-06-3 ZCAPLUS

CN Poly[(1,3,6,8-tetrahydro-1,3,6,8-tetraoxobenzo[lmn][3,8]phenanthroline-2,7-diyl)-1,4-phenyleneoxy(2-sulfo-1,4-phenylene)[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene](3-sulfo-1,4-phenylene)oxy-1,4-phenylene] (9CI) (CA INDEX NAME)

PAGE 1-A



PAGE 1-B

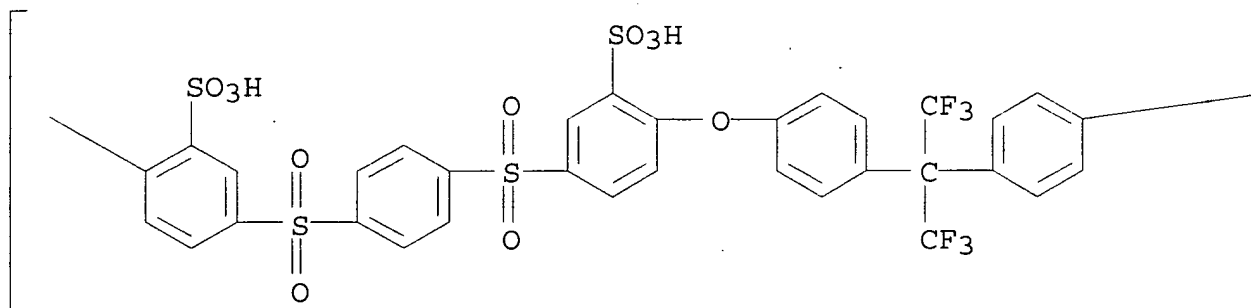


CC 38-3 (Plastics Fabrication and Uses)

- Section cross-reference(s): 37
- IT 74-84-0, Ethane, properties 74-85-1, Ethylene, properties  
74-98-6, Propane, properties 115-07-1, Propylene, properties  
124-38-9, Carbon dioxide, properties 7727-37-9, Nitrogen,  
properties 7782-44-7, Oxygen, properties 177601-69-3  
177601-70-6 302924-87-4 **444075-05-2 444075-06-3**  
444075-07-4 444075-08-5  
(gas permeation properties of flexible pyrolytic membranes from  
sulfonated polyimides)
- L14 ANSWER 3 OF 7 ZCAPLUS COPYRIGHT 2003 ACS on STN  
2002:230200 Document No. 137:20909 Design of monomeric and polymeric  
sulfur based materials. Abd-El-Aziz, Alaa S.; McFarlane, Shuane L.;  
Afifi, Tarek H.; Corkery, T. Chris (Dep. Chem., The Univ. Winnipeg,  
Winnipeg, MB, R3B 2E9, Can.). Polymer Preprints (American Chemical  
Society, Division of Polymer Chemistry), 43(1), 506-507 (English)  
2002 CODEN: ACPPAY. ISSN: 0032-3934. Publisher: American  
Chemical Society, Division of Polymer Chemistry.
- AB Our research interests have been focused on the design of new  
monomeric and polymeric materials using organoiron complexes as  
precursors. Cyclopentadienyliron chloroarene complexes were used to  
mediate the synthesis of sulfide contg. compds. These compds. were  
designed with various arom. and aliph. spacers. Oxidn. of the  
sulfides led to the isolation of the sulfone monomers with terminal  
chloro groups. These monomers were also subjected to sulfonation  
reactions to give their corresponding sulfonic acid salts in very  
good yields. Polycondensation of the monomers with diphenolic  
reagents led to the formation of the polysulfones.
- IT **434941-88-5P 434941-95-4P**  
(prepn. and characterization of sulfide-based monomeric and  
polymeric materials using cyclopentadienyliron chloroarene  
complexes as reagent mediators)
- RN 434941-88-5 ZCAPLUS
- CN Poly[oxy-1,4-phenylene[2,2,2-trifluoro-1-  
(trifluoromethyl)ethylidene]-1,4-phenyleneoxy(2-sulfo-1,4-  
phenylene)sulfonyl-1,4-phenylenesulfonyl(3-sulfo-1,4-phenylene)  
disodium salt] (9CI) (CA INDEX NAME)

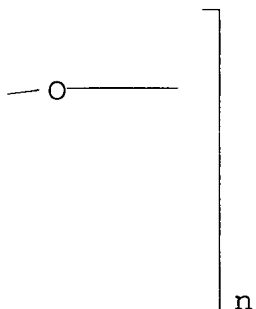


PAGE 1-A



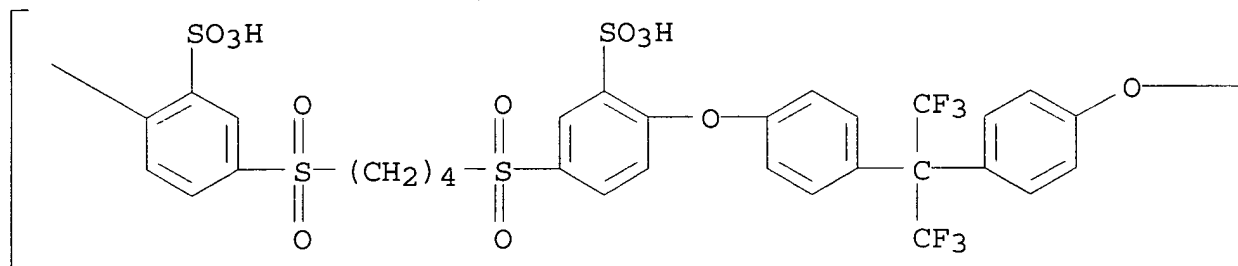
● 2 Na

PAGE 1-B



RN 434941-95-4 ZCAPLUS  
 CN Poly[oxy-1,4-phenylene[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]-1,4-phenyleneoxy(2-sulfo-1,4-phenylene)sulfonyl-1,4-butanediylsulfonyl(3-sulfo-1,4-phenylene)disodium salt] (9CI) (CA INDEX NAME)

PAGE 1-A



⊕ 2 Na

PAGE 1-B

CC 37-2 (Plastics Manufacture and Processing)  
 Section cross-reference(s): 35, 38

IT 126430-89-5P 434941-75-0P 434941-76-1P 434941-77-2P  
 434941-78-3P 434941-79-4P 434941-80-7P 434941-81-8P  
 434941-82-9P 434941-83-0P 434941-84-1P 434941-85-2P  
 434941-87-4P **434941-88-5P** 434941-89-6P 434941-90-9P  
 434941-91-0P 434941-92-1P 434941-94-3P **434941-95-4P**  
 434941-96-5P 434941-97-6P 434941-98-7P 434941-99-8P  
 (prepn. and characterization of sulfide-based monomeric and  
 polymeric materials using cyclopentadienyliron chloroarene  
 complexes as reagent mediators)

L14 ANSWER 4 OF 7 ZCAPLUS COPYRIGHT 2003 ACS on STN  
 2000:593953 Document No. 133:310224 Sulfonated aromatic diamines as  
 precursors for polyimides for proton exchange membranes. Shobha, H.  
 K.; Sankarapandian, M.; Glass, T. E.; McGrath, J. E. (Department of  
 Chemistry, Center for High Performance Polymeric Adhesives and  
 Composites, Virginia Polytechnic Institute and State University,  
 Blacksburg, VA, 24061-0344, USA). Polymer Preprints (American  
 Chemical Society, Division of Polymer Chemistry), 41(2), 1298-1299  
 (English) 2000. CODEN: ACPPAY. ISSN: 0032-3934. Publisher:

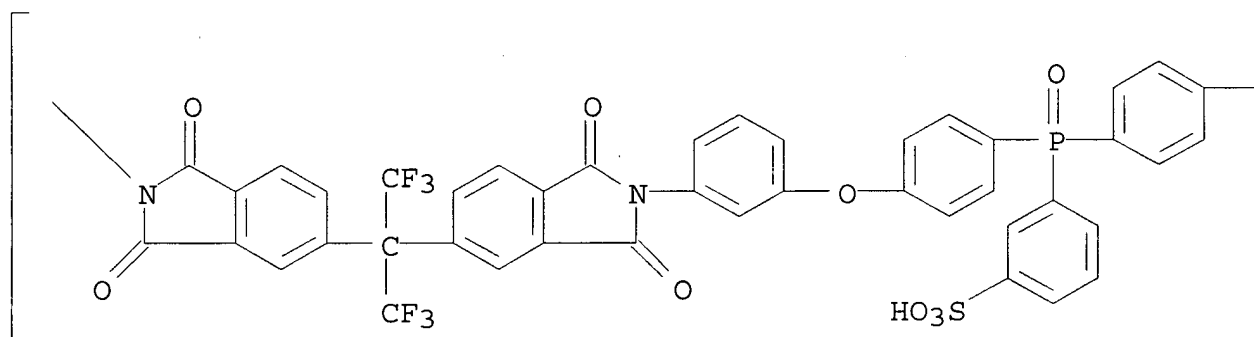
AB American Chemical Society, Division of Polymer Chemistry.  
 Sodium sulfonated bis(3-aminophenyl)phenyl phosphine oxide was  
 prepd. and characterized. Sulfonated and unsulfonated poly(arylene  
 ether phosphine oxide) oligomers were prepd. High-mol.-wt.  
 sulfonated polyimide was prepd. by polymn. of the sulfonated diamine  
 with 6FDA.

IT **302554-22-9P**  
 (prepn. and characterization of)

RN 302554-22-9 ZCAPLUS

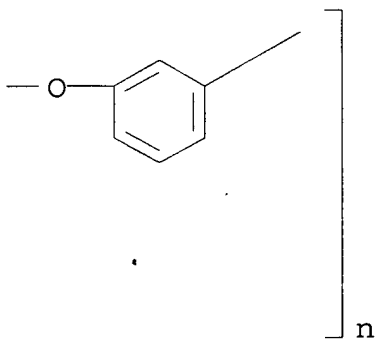
CN Poly[(1,3-dihydro-1,3-dioxo-2H-isoindole-2,5-diyl)[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene](1,3-dihydro-1,3-dioxo-2H-isoindole-5,2-diyl)-1,3-phenyleneoxy-1,4-phenylene[(3-sulfophenyl)phosphinylidene]-1,4-phenyleneoxy-1,3-phenylene sodium salt] (9CI) (CA INDEX NAME)

PAGE 1-A

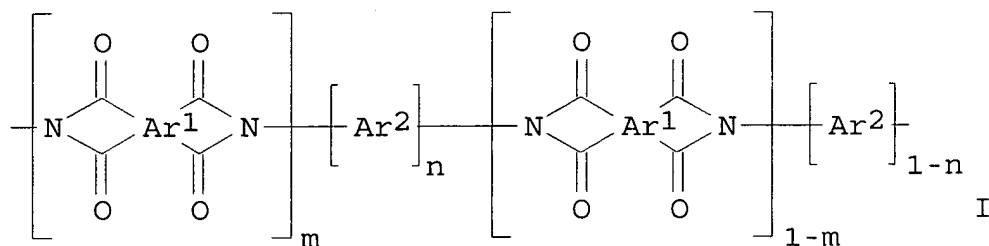


● Na

PAGE 1-B

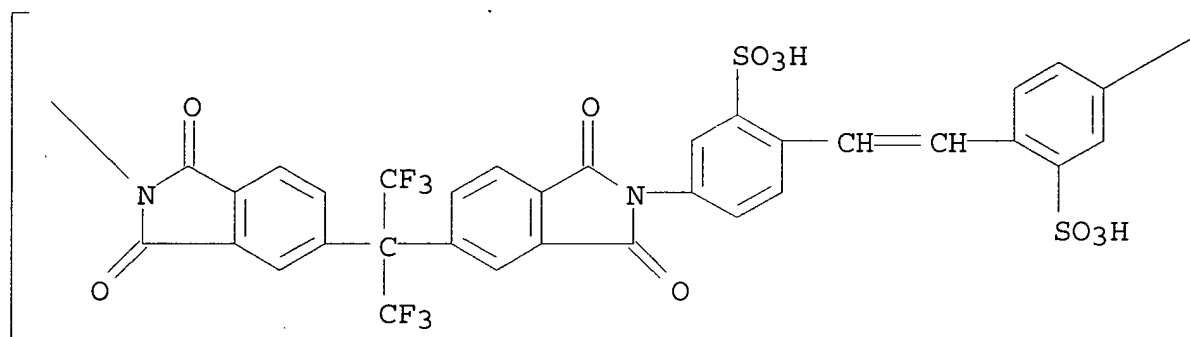


- CC 35-5 (Chemistry of Synthetic High Polymers)  
Section cross-reference(s): 38
- IT 591-27-5DP, 3-Aminophenol, reaction products with phosphine  
oxide-contg. polyethers 302554-21-8P **302554-22-9P**  
302554-23-ODP, reaction products with aminophenol  
(prepn. and characterization of)
- L14 ANSWER 5 OF 7 ZCAPLUS COPYRIGHT 2003 ACS on STN  
1998:175338 Document No. 128:218127 Gas separation and sulfonated  
polyimides for membranes used in the same. Ozcayir, Yurdagul F.;  
Goetz, Gertrud; Bikson, Benjamin (Praxair Technology, Inc., USA).  
U.S. US 5725633 A 19980310, 13 pp., Cont.-in-part of U.S.  
5,618,334. (English). CODEN: USXXAM. APPLICATION: US 1996-656953  
19960606. PRIORITY: US 1995-497655 19950630.
- GI



- AB The title process for sepg. one or more gases from a mixt. of gases  
comprise steps of bringing a gas mixt. into contact with a first  
side of a gas sepn. membrane such that a portion of the gas mixt.  
permeate to a second side of the membrane and a portion of the gas  
mixt. on the second side of the membrane being enriched in one or  
more components over that of the mixt. on the first side of the  
membrane, wherein the gas sepn. membrane is formed from a sulfonated  
polyimide comprising the repeating units I (Ar1 = dianhydride  
residue; Ar2 = arom. sulfonated diamine residue; Ar3 = arom. diamine  
residue; n = 0.01-1; m = 0-1.0). Gas sepn. membrane of  
4,4'-diaminostilbene-2,2'-disulfonic acid lithium  
salt-2,2-bis(3,4-dicarboxyphenyl)hexafluoropropane dianhydride  
copolymer showed O/N and He/N sepn. factors 11 and 830, resp.
- IT **186457-78-3P**  
(gas sepn. and sulfonated polyimides for membranes used in the  
same)
- RN 186457-78-3 ZCAPLUS
- CN Poly[(1,3-dihydro-1,3-dioxo-2H-isoindole-2,5-diyl) [2,2,2-trifluoro-1-  
(trifluoromethyl)ethylidene] (1,3-dihydro-1,3-dioxo-2H-isoindole-5,2-  
diyl) (3-sulfo-1,4-phenylene)-1,2-ethenediyl (2-sulfo-1,4-phenylene)  
dilithium salt] (9CI) (CA INDEX NAME)

PAGE 1-A



● 2 Li

PAGE 1-B

IC ICM B01D053-22  
 ICS B01D071-64; B01D071-68  
 NCL 095045000  
 CC 38-3 (Plastics Fabrication and Uses)  
 IT 186457-73-8P 186457-75-0P 186457-76-1P 186457-77-2P  
**186457-78-3P** 200290-30-8P 204271-73-8P 204271-74-9P  
 204271-75-0P 204271-76-1P  
 (gas sepn. and sulfonated polyimides for membranes used in the same)

L14 ANSWER 6 OF 7 ZCAPLUS COPYRIGHT 2003 ACS on STN  
 1997:801885 Document No. 128:62557 Novel sulfonated polyimide gas separation membranes. Ozcayir, Yurdagul F.; Goetz, Gertrud; Bikson, Benjamin (Praxair Technology, Inc., USA). Eur. Pat. Appl. EP 811421

A1 19971210, 18 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, FI. (English). CODEN: EPXXDW. APPLICATION: EP 1997-109123 19970605. PRIORITY: US 1996-656953 19960606.

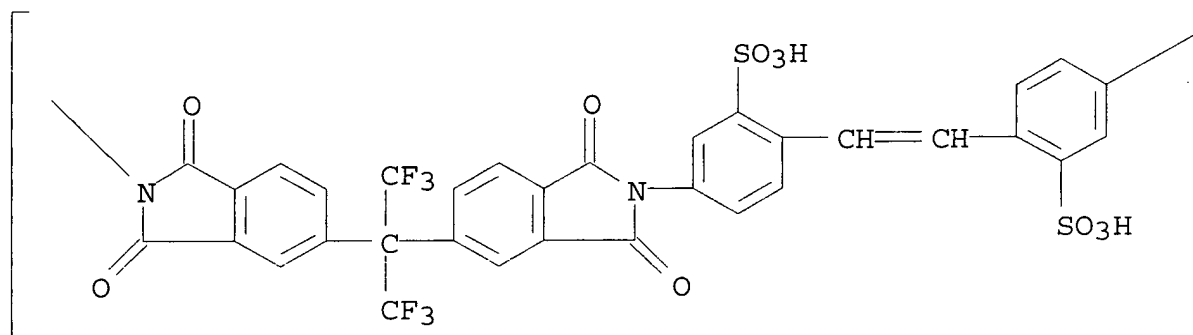
AB The polyimides are prepd. from rigid arom. dianhydrides and arom. diamines bearing sulfonic acid (or salt), or sulfonic ester groups. Methods of prepg. improved composite gas sepn. membranes from the sulfonated polyimides are included. Thus, a membrane was prepd. from 2,2-bis(3,4-dicarboxyphenyl)hexafluoropropane dianhydride-4,4'-diaminostilbene-2,2'-disulfonic acid Li salt copolymer.

IT **186457-78-3P 186457-79-4P**  
(sulfonated polyimide gas sepn. membranes)

RN 186457-78-3 ZCAPLUS

CN Poly[(1,3-dihydro-1,3-dioxo-2H-isoindole-2,5-diyl)[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene](1,3-dihydro-1,3-dioxo-2H-isoindole-5,2-diyl)(3-sulfo-1,4-phenylene)-1,2-ethenediyl(2-sulfo-1,4-phenylene)dilithium salt] (9CI) (CA INDEX NAME)

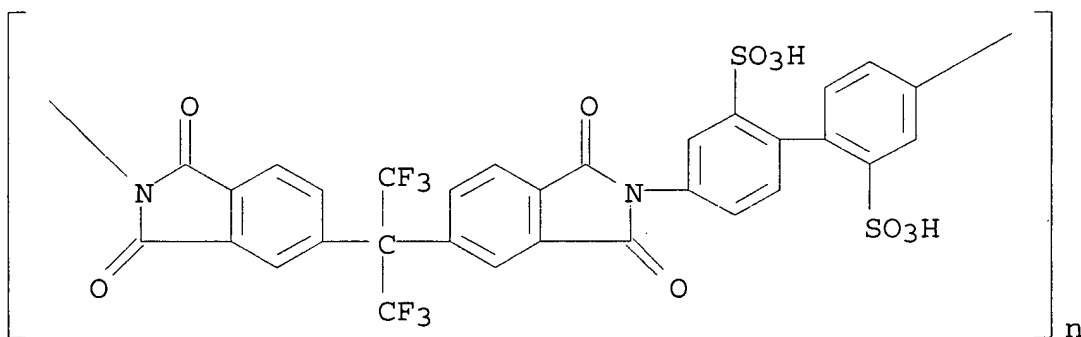
PAGE 1-A



PAGE 1-B

] n

RN 186457-79-4 ZCAPLUS  
 CN Poly[(1,3-dihydro-1,3-dioxo-2H-isoindole-2,5-diyl) [2,2,2-trifluoro-1-(trifluoromethyl)ethylidene] (1,3-dihydro-1,3-dioxo-2H-isoindole-5,2-diyl) (2,2'-disulfo[1,1'-biphenyl]-4,4'-diyl) dilithium salt] (9CI)  
 (CA INDEX NAME)



● 2 Li

IC ICM B01D071-64  
 ICS B01D053-22; C08G073-10  
 CC 38-3 (Plastics Fabrication and Uses)  
 Section cross-reference(s): 35  
 IT 186457-73-8P, 2,2-Bis(3,4-dicarboxyphenyl)hexafluoropropane  
 dianhydride-4,4'-diaminostilbene-2,2'-disulfonic acid lithium salt  
 copolymer 186457-74-9P 186457-75-0P 186457-76-1P  
 186457-77-2P **186457-78-3P 186457-79-4P**  
 200290-30-8P 200290-31-9P 200290-32-0P 200290-33-1P  
 200290-34-2P  
 (sulfonated polyimide gas sepn. membranes)

L14 ANSWER 7 OF 7 ZCAPLUS COPYRIGHT 2003 ACS on STN  
 1997:127438 Document No. 126:132444 Sulfonated polyimide gas separation membranes and sulfonated polyimides sol. in low boiling solvents. Ozcayir, Yurdagul F.; Goetz, Gertrud; Bikson, Benjamin (Praxair Technology, Inc., USA). Eur. Pat. Appl. EP 750939 A2 19970102, 10 pp. DESIGNATED STATES: R: DE, FR, IT. (English). CODEN: EPXXDW. APPLICATION: EP 1996-110538 19960628. PRIORITY: US 1995-497655 19950630.

AB The title arom. polyimides are prepd. by dissolving polyimide precursor in solvent, cooling to <10.degree., sulfonating, neutralizing with base, and recovering sulfonated polyimide, or by reaction of diamine contg. a sulfonic group with a dicarboxylic acid anhydride. Thus, SO<sub>3</sub> treatment of 6FDA-2,4,6-trimethylphenylenediamine copolymer and subsequent neutralization with Li counterion gave a sulfonated polyimide (ion exchange capacity 1.3 mequiv./g polymer) having permeabilities (30.degree.) of 95.4, 11.6, 2.36, 1.18, 56.2 Barrer to He, O (g), N (g), CH<sub>4</sub>, and CO<sub>2</sub> and O/N, He/N, CO<sub>2</sub>/CH<sub>4</sub> sepn. factor 4.9 and 40 and 47, resp.

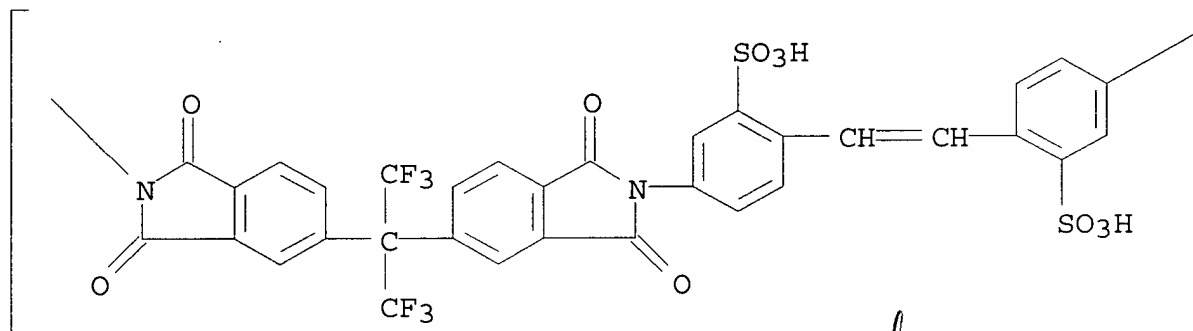
IT **186457-78-3P 186457-79-4P**

(sulfonated polyimide gas sepn. membranes and sulfonated polyimides sol. in low boiling solvents)

RN 186457-78-3 ZCAPLUS

CN Poly[(1,3-dihydro-1,3-dioxo-2H-isoindole-2,5-diyl) [2,2,2-trifluoro-1-(trifluoromethyl)ethylidene] (1,3-dihydro-1,3-dioxo-2H-isoindole-5,2-diyl) (3-sulfo-1,4-phenylene)-1,2-ethenediyl (2-sulfo-1,4-phenylene) dilithium salt] (9CI) (CA INDEX NAME)

PAGE 1-A



Chm 1

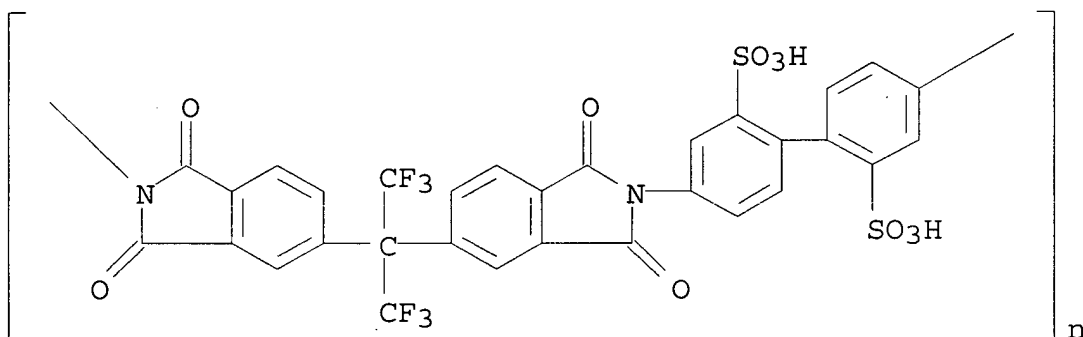
● 2 Li



PAGE 1-B

] n

RN 186457-79-4 ZCAPLUS  
 CN Poly[(1,3-dihydro-1,3-dioxo-2H-isoindole-2,5-diyl)[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene](1,3-dihydro-1,3-dioxo-2H-isoindole-5,2-diyl)(2,2'-disulfo[1,1'-biphenyl]-4,4'-diyl) dilithium salt] (9CI)  
 (CA INDEX NAME)



● 2 Li

IC ICM B01D071-64  
 ICS B01D053-22; C08G073-10  
 CC 38-3 (Plastics Fabrication and Uses)  
 Section cross-reference(s): 35  
 IT 110972-59-3DP, 6FDA-2,4,6-trimethyl-1,3-phenylenediamine copolymer, sulfonated 112870-06-1DP, 6FDA-2,4,6-trimethyl-1,3-phenylenediamine copolymer, sru, sulfonated 186457-73-8P  
 186457-74-9P 186457-75-0P 186457-76-1P 186457-77-2P  
**186457-78-3P 186457-79-4P**  
 (sulfonated polyimide gas sepn. membranes and sulfonated polyimides sol. in low boiling solvents)

=> d 120 1-22 cbib abs hitstr hitind

L20 ANSWER 1 OF 22 ZCAPLUS COPYRIGHT 2003 ACS on STN  
2003:734849 Manufacture of sulfonate group-containing polymers. Ogami,  
Koichi; Takasugi, Shingo; Otsuki, Toshitaka (JSR Ltd., Japan). Jpn.  
Kokai Tokkyo Koho JP 2003261653 A2 20030919, 10 pp. (Japanese).  
CODEN: JKXXAF. APPLICATION: JP 2002-61034 20020306.

AB The polymers for battery electrolytes, displays, sensors,  
capacitors, ion exchange **membranes**, etc., are manufd. by  
sulfonating polyarylenes with (1) .gtoreq.10 mL (based on 1 g of  
polyarylenes) of 95-97.4%-concn. H2SO4 at .gtoreq.20.degree. or (2)  
.gtoreq.3 mL (based on 1 g of polyarylenes) of .gtoreq.97.5%-concn.  
H2SO4 at .ltoreq.25.degree.. Thus, 2,2-bis(4-hydroxyphenyl)-  
1,1,1,3,3,3-hexafluoropropane-4,4'-dichlorobenzophenone copolymer  
oligomer was reacted with 2,5-dichloro-4'-(4-  
phenoxy)phenoxybenzophenone to give a copolymer, 25 g of which was  
reacted with 750 mL of 96.4%-H2SO4 at 25.degree. to give a  
sulfonate-contg. polymer having sulfonate equiv. 2.1 mg-equiv/g and  
high hot water resistance.

IT **596808-83-2DP, sulfonated**  
(manuf. of **sulfonate**-contg. polymers by  
**sulfonating** polyarylenes with H2SO4 at controlled  
condition)

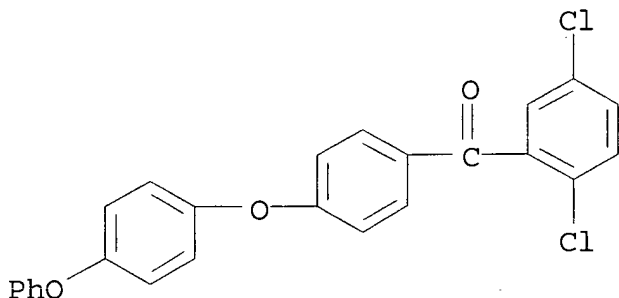
RN 596808-83-2 ZCAPLUS

CN Methanone, bis(4-chlorophenyl)-, polymer with (2,5-dichlorophenyl)[4-  
(4-phenoxyphenoxy)phenyl]methanone and 4,4'-[2,2,2-trifluoro-1-  
(trifluoromethyl)ethylidene]bis[phenol], block (9CI) (CA INDEX  
NAME)

CM 1

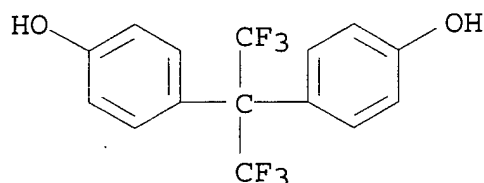
CRN 463954-50-9

CMF C25 H16 Cl2 O3



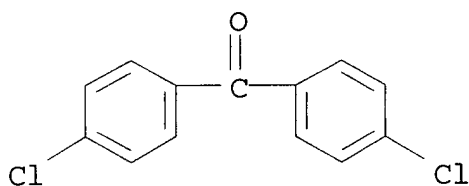
CM 2

CRN 1478-61-1  
CMF C15 H10 F6 O2



CM 3

CRN 90-98-2  
CMF C13 H8 Cl2 O



IC ICM C08G061-00  
CC 37-3 (Plastics Manufacture and Processing)  
IT 7664-93-9DP, Sulfuric acid, reaction products with polyarylenes  
**596808-83-2DP, sulfonated**  
(manuf. of **sulfonate**-contg. polymers by  
**sulfonating** polyarylenes with H2SO4 at controlled  
condition)

L20 ANSWER 2 OF 22 ZCAPLUS COPYRIGHT 2003 ACS on STN  
2003:671154 Document No. 139:197952 Drying method of sulfonated  
polymers without heat decomposition. Takahashi, Masayuki; Goto,  
Kohei (JSR Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2003238690 A2  
20030827, 9 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP  
2002-46080 20020222.

AB Sulfonated polymers are washed with water and dried at a temp. lower  
than desulfonation-derived heat-decompn. temp. measured by DSC  
(under N, temp. increase 20.degree./min) by .gtoreq.120.degree. for  
water content 2-8%. The polymers are useful for proton conductors,  
etc. Chlorobenzoyl-terminated 2,2-bis(4-hydroxyphenyl)-1,1,1,3,3,3-  
hexafluoropropane-4,4'-dichlorobenzophenone copolymer was polymd.  
with 2,5-dichloro-4'-(4-phenoxy)phenoxybenzophenone, reacted with  
H2SO4, and washed with water to give a sulfonated polymer  
(heat-decompn. temp. 244.degree.), which was dried at 75.degree. for  
48 h, showing no gel formation when dissolved in MeOH/NMP.

IT **582334-13-2DP, sulfonated**

(drying method of sulfonated polymers without heat decompn.)

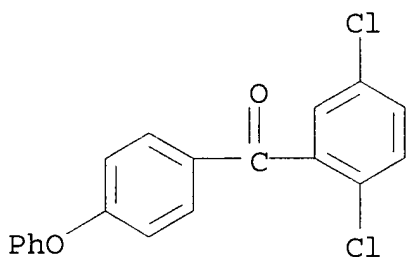
RN 582334-13-2 ZCAPLUS

CN Methanone, bis(4-chlorophenyl)-, polymer with (2,5-dichlorophenyl)(4-phenoxyphenyl)methanone and 4,4'-[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis[phenol] (9CI) (CA INDEX NAME)

CM 1

CRN 151173-25-0

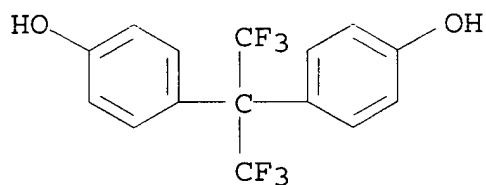
CMF C19 H12 Cl2 O2



CM 2

CRN 1478-61-1

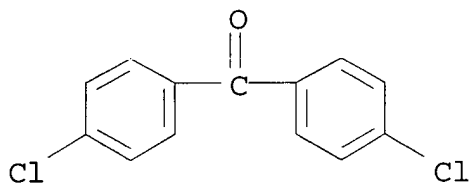
CMF C15 H10 F6 O2



CM 3

CRN 90-98-2

CMF C13 H8 Cl2 O



IC ICM C08G085-00  
CC 35-8 (Chemistry of Synthetic High Polymers)  
Section cross-reference(s): 37, 76  
IT **582334-13-2DP, sulfonated**  
(drying method of sulfonated polymers without heat decompn.)

L20 ANSWER 3 OF 22 ZCAPLUS COPYRIGHT 2003 ACS on STN  
2003:568621 Document No. 139:118408 Halogenated aromatic compound,  
(co)polymer thereof, and proton-conductive **membrane**  
comprising same. Yamakawa, Yoshitaka; Takahashi, Masayuki; Goto,  
Kohei (JSR Corporation, Japan). Eur. Pat. Appl. EP 1329444 A1  
20030723, 33 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR,  
GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY,  
AL, TR, BG, CZ, EE, HU, SK. (English). CODEN: EPXXDW.  
APPLICATION: EP 2003-1191 20030121. PRIORITY: JP 2002-13450  
20020122.

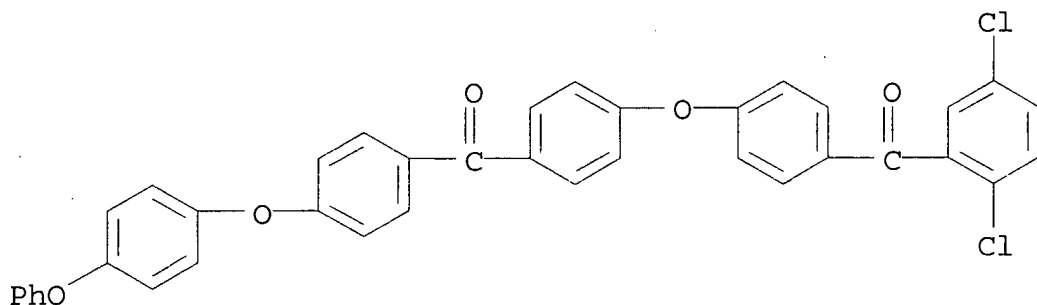
AB A halogenated arom. compd., a polyarylene (co)polymer obtained by  
the polymn. of such a halogenated arom. compd. as a monomer  
component, and a proton-conductive **membrane** made of a  
sulfonation product of such a (co)polymer are disclosed. The  
halogenated arom. compd. is represented by the following general  
formula R1X1A(X2BX3A)aX4B(X5B)bZ (A = electron-withdrawing group; B  
= electron-donating atom or divalent group; X = halogenated  
phenylene groups; Z = aryl group; a, b = 1-20). Thus, adding  
2,5-dichloro-4'-[4-[4-(4-phenoxy)phenoxy]benzoyl]phenoxybenzophenone  
12.3, [4,4'-dichlorobenzophenone 2,2-bis(4-hydroxyphenyl)-  
1,1,1,3,3,3-hexafluoropropane] (Mn 12,200) 6.83,  
bis(triphenylphosphine)nickel dichloride 0.589, NaI 0.507,  
triphenylphosphine 2.73 and Zn 4.08 g to a flask, after purging with  
N<sub>2</sub>, combining with 54.6 mL N-methylpyrrolidone and heating with  
stirring at 80.degree. for 3 h gave a polymer which was pptd. and  
sulfonated to give a conductive polymer. The polymer was sol. in  
N-methylpyrrolidone and THF and insol. in acetone, methanol, and  
water. A solvent-cast film made from the sulfonated polymer had  
good strength and resistance to hot water and Fenton's reagent.

IT **565228-58-2DP, sulfonated** products  
(manuf. of halogenated arom. compds. for polymers useful for  
proton-conductive **membrane** prodn.)

RN 565228-58-2 ZCAPLUS  
CN Methanone, bis(4-chlorophenyl)-, polymer with [4-[4-(2,5-  
dichlorobenzoyl)phenoxy]phenyl] [4-(4-phenoxyphenoxy)phenyl]methanone  
and 4,4'-[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis[phenol]  
(9CI) (CA INDEX NAME)

CM 1

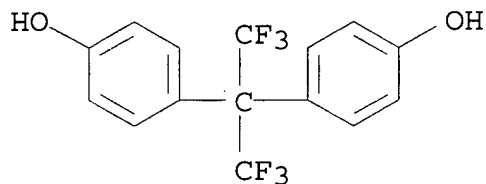
CRN 565228-55-9  
CMF C38 H24 Cl2 O5



CM 2

CRN 1478-61-1

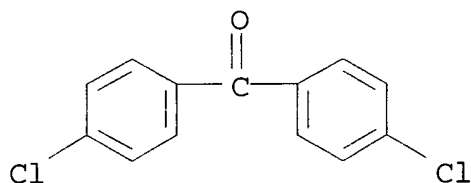
CMF C15 H10 F6 O2



CM 3

CRN 90-98-2

CMF C13 H8 Cl2 O



IC ICM C07C049-84  
 ICS C07C317-22; C08G065-40; C08G061-12; C08G075-23; C08J005-22  
 CC 38-3 (Plastics Fabrication and Uses)  
 ST halogenated polyphenyl sulfonation proton conductive  
**membrane** manuf; chem hot water resistance **membrane**  
 sulfonated polyphenyl polymer  
 IT **Membranes**, nonbiological  
 (manuf. of halogenated arom. compds. for polymers useful for  
 proton-conductive **membrane** prodn.)

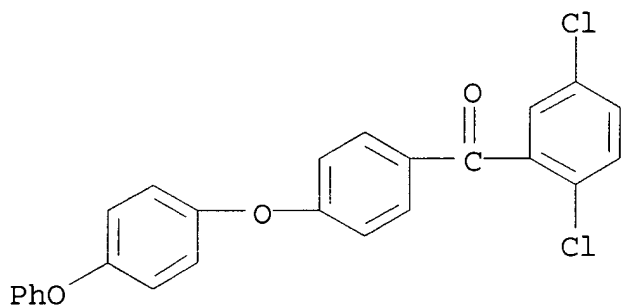
- IT Polyketones  
(polyether-, fluorine-contg.; manuf. of halogenated arom. compds. for polymers useful for proton-conductive **membrane** prodn.)
- IT Fluoropolymers, uses  
(polyether-polyketone-; manuf. of halogenated arom. compds. for polymers useful for proton-conductive **membrane** prodn.)
- IT Polyoxyphenylenes  
(polyketone-, fluorinated; manuf. of halogenated arom. compds. for polymers useful for proton-conductive **membrane** prodn.)
- IT Polyethers, uses  
(polyketone-, fluorine-contg.; manuf. of halogenated arom. compds. for polymers useful for proton-conductive **membrane** prodn.)
- IT Polyketones  
(polyoxyphenylene-, fluorinated; manuf. of halogenated arom. compds. for polymers useful for proton-conductive **membrane** prodn.)
- IT 565228-58-2DP, **sulfonated** products  
(manuf. of halogenated arom. compds. for polymers useful for proton-conductive **membrane** prodn.)
- IT 69266-28-0P 122325-09-1P, Bisphenol AF-4,4'-dichlorobenzophenone copolymer 151173-25-0P, 2,5-Dichloro-4'-phenoxybenzophenone 565228-52-6P 565228-55-9P 565228-58-2P  
(manuf. of halogenated arom. compds. for polymers useful for proton-conductive **membrane** prodn.)
- IT 101-84-8, Diphenyl ether 403-43-0, 4-Fluorobenzoic acid chloride 831-82-3, 4-Phenoxyphenol 2905-61-5, 2,5-Dichlorobenzoyl chloride  
(manuf. of halogenated arom. compds. for polymers useful for proton-conductive **membrane** prodn.)
- L20 ANSWER 4 OF 22 ZCAPLUS COPYRIGHT 2003 ACS on STN  
2003:550271 Document No. 139:119897 Polymer electrolyte composition and proton-conductive **membrane** for **fuel** cell. Okaniwa, Motoki; Goto, Kohei (JSR Ltd., Japan). Jpn. Kokai-Tokkyo Koho JP 2003201403 A2 20030718, 21 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2002-2793 20020109.
- AB The compn. contains a polymer electrolyte and an antioxidant contg. (a) .gtoreq.1 compd. selected from a phenolic OH-contg. compd. and an amine and (b) an org. P or org. S compd. except the phenols or amines. The proton-conductive **membrane** is that made of the compn. showing enhancement of resistance to oxidn. by H2O2 radical (generated in **fuel cells**) without affecting proton cond. and mech. strength.
- IT 463963-71-5DP, **sulfonated**  
(polymer electrolyte compn. contg. antioxidant for proton-conductive **membrane** in **fuel** cell)
- RN 463963-71-5 ZCAPLUS  
CN Methanone, bis(4-chlorophenyl)-, polymer with (2,5-dichlorophenyl)[4-(4-phenoxyphenoxy)phenyl]methanone and 4,4'-[2,2,2-trifluoro-1-

(trifluoromethyl)ethylidene]bis[phenol] (9CI) (CA INDEX NAME)

CM 1

CRN 463954-50-9

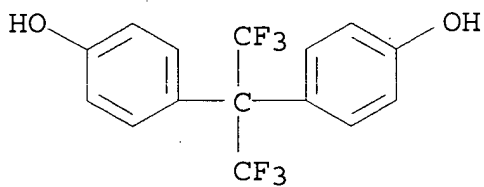
CMF C25 H16 Cl2 O3



CM 2

CRN 1478-61-1

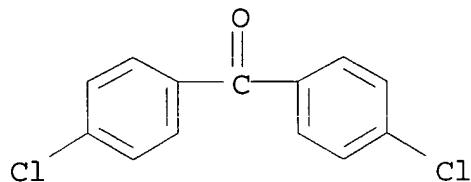
CMF C15 H10 F6 O2



CM 3

CRN 90-98-2

CMF C13 H8 Cl2 O



IC ICM C08L101-00  
ICS C08G065-12; C08K005-13; C08K005-17; C08K005-36; C08K005-49;



- C08L071-00; C25B013-08; H01M008-02; H01M008-10
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)  
Section cross-reference(s): 38
- ST polymer electrolyte compn proton conductive **membrane**;  
antioxidant phenol amine org phosphorus compd; sulfur compd  
antioxidant polymer electrolyte; radical resistance polymer  
electrolyte **fuel cell**
- IT Polyketones  
(polyether-, fluorine-contg.; polymer electrolyte compn. contg.  
antioxidant for proton-conductive **membrane** in  
**fuel cell**)
- IT Fluoropolymers, uses  
(polyether-polyketone-; polymer electrolyte compn. contg.  
antioxidant for proton-conductive **membrane** in  
**fuel cell**)
- IT Polyethers, uses  
(polyketone-, fluorine-contg.; polymer electrolyte compn. contg.  
antioxidant for proton-conductive **membrane** in  
**fuel cell**)
- IT Antioxidants  
**Fuel cells**  
Polymer electrolytes  
(polymer electrolyte compn. contg. antioxidant for  
proton-conductive **membrane** in **fuel**  
**cell**)
- IT Ionic conductors  
(protonic; polymer electrolyte compn. contg. antioxidant for  
proton-conductive **membrane** in **fuel**  
**cell**)
- IT 364062-39-5DP, 4,4'-Dichlorobenzophenone-2,5-Dichloro-4'-  
phenoxybenzophenone copolymer, sulfonated **463963-71-5DP**,  
**sulfonated**  
(polymer electrolyte compn. contg. antioxidant for  
proton-conductive **membrane** in **fuel**  
**cell**)
- IT 693-36-7, Distearyl-3,3'-thiodipropionate 1455-42-1D,  
3,9-Bis(2-hydroxy-1,1-dimethylethyl)-2,4,8,10-  
tetraoxaspiro[5.5]undecane, ester mixt. 1703-58-8D,  
1,2,3,4-Butanetetra-carboxylic acid, ester mixt. 1709-70-2,  
1,3,5-Trimethyl-2,4,6-tris[3,5-di(tert-butyl)-4-  
hydroxybenzyl]benzene 2403-89-6D, 1,2,2,6,6-Pentamethyl-4-  
piperidinol, ester mixt. 6683-19-8, Pentaerythrityl  
tetrakis[3-[3,5-di(tert-butyl)-4-hydroxyphenyl]propionate]  
27676-62-6, Tris[3,5-di(tert-butyl)-4-hydroxybenzyl] isocyanurate  
29598-76-3 80693-00-1, Bis[2,6-di(tert-butyl)-4-  
methylphenyl]pentaerythritol diphosphite 561307-00-4  
(polymer electrolyte compn. contg. antioxidant for  
proton-conductive **membrane** in **fuel**  
**cell**)

**membrane** and its use in **membrane-electrode** structure for solid polymer **fuel cell**. Manda, Naoki; Kanaoka, Osayuki; Asano, Yoichi (Honda Motor Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2003201352 A2 20030718, 18 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2002-1707 20020108.

AB The **membrane** contains (A) sulfonated polymers having arom. groups in main chains and/or side chains and (B) antioxidants which have plural phenolic groups and consists of C and H only except for O in the phenolic groups. The antioxidants may be 1,1,3-tris(2-methyl-4-hydroxy-5-tert-butylphenyl)butane, 4,4'-butylidenebis(6-tert-butyl-3-methylphenol), or 1,3,5-trimethyl-2,4,6-tris(3,5-tert-butyl-4-hydroxybenzyl)benzene. Alternatively, the **membrane** has a layer of A between a pair of buffer layers contg. ion conductors and B and satisfies total thickness of the buffer layers is lower than the thickness of the A layer. The **fuel cell** has a **membrane-electrode** structure made of the **membrane** sandwiched between a pair of electrodes. The **membrane** has high resistance to oxidn. and heat.

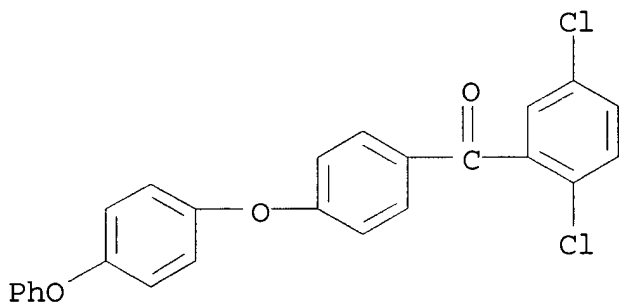
IT 463963-68-0DP, sulfonated  
(oxidn.- and heat-resistant **sulfonated** arom. polymer electrolyte **membrane** contg. phenolic antioxidant for **membrane-electrode** structure in **fuel cell**)

RN 463963-68-0 ZCAPLUS  
CN Methanone, [[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis(4,1-phenyleneoxy-4,1-phenylene)]bis[(4-chlorophenyl)-, polymer with (2,5-dichlorophenyl)[4-(4-phenoxyphenoxy)phenyl]methanone (9CI) (CA INDEX NAME)

CM 1

CRN 463954-50-9

CMF C25 H16 Cl2 O3

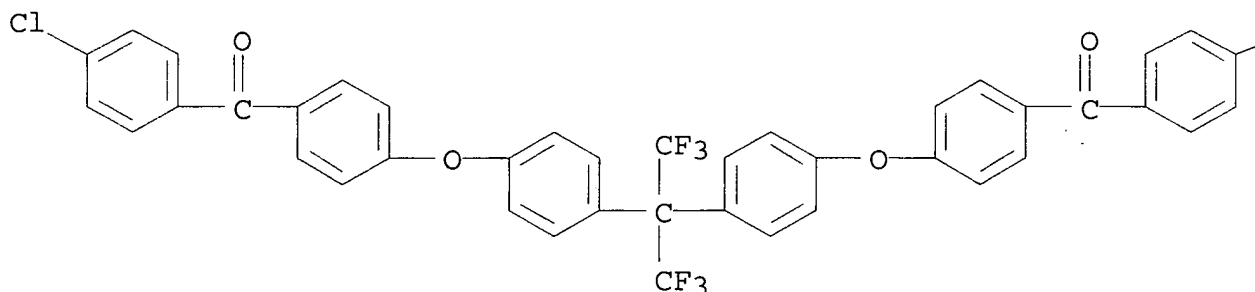


CM 2

CRN 389634-34-8

CMF C41 H24 Cl2 F6 O4

PAGE 1-A

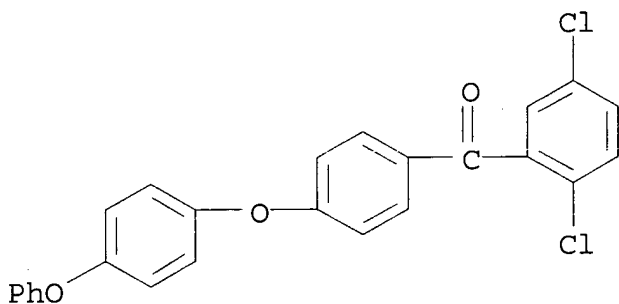


PAGE 1-B

Cl

- IC ICM C08J005-22  
ICS C08K005-13; C08L101-06; H01B001-06; H01M008-02; H01M008-10
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)  
Section cross-reference(s): 38
- ST sulfonated polymer electrolyte **membrane** antioxidant  
**fuel cell**; phenolic antioxidant polymer  
electrolyte **membrane fuel cell**;  
electrode **membrane** structure solid polymer **fuel**  
**cell**; ion conductor antioxidant composite polymer  
electrolyte **membrane**
- IT Antioxidants  
**Fuel cell** electrolytes  
Polymer electrolytes  
(oxidn.- and heat-resistant sulfonated arom. polymer electrolyte  
**membrane** contg. phenolic antioxidant for **membrane**  
-electrode structure in **fuel cell**)
- IT Polyketones  
(polyarylene-polyoxyphenylene-, fluorine-contg., sulfonated;  
oxidn.- and heat-resistant sulfonated arom. polymer electrolyte  
**membrane** contg. phenolic antioxidant for **membrane**  
-electrode structure in **fuel cell**)
- IT Polyoxyphenylenes  
(polyketone-, sulfonated; oxidn.- and heat-resistant sulfonated  
arom. polymer electrolyte **membrane** contg. phenolic  
antioxidant for **membrane**-electrode structure in  
**fuel cell**)
- IT Polyketones  
(polyoxyphenylene-, sulfonated; oxidn.- and heat-resistant  
sulfonated arom. polymer electrolyte **membrane** contg.  
phenolic antioxidant for **membrane**-electrode structure

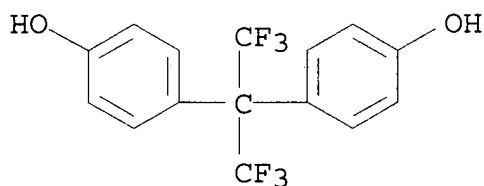
- in fuel cell)
- IT 85-60-9, 4,4'-Butylidenebis(6-tert-butyl-3-methylphenol) 1709-70-2  
1843-03-4, 1,1,3-Tris(2-methyl-4-hydroxy-5-tert-butylphenyl)butane  
(antioxidant; oxidn.- and heat-resistant sulfonated arom. polymer  
electrolyte **membrane** contg. phenolic antioxidant for  
**membrane**-electrode structure in fuel  
cell)
- IT 31694-16-3DP, sulfonated 463963-68-0DP, sulfonated  
(oxidn.- and heat-resistant **sulfonated** arom. polymer  
electrolyte **membrane** contg. phenolic antioxidant for  
**membrane**-electrode structure in fuel  
cell)
- L20 ANSWER 6 OF 22 ZCAPLUS COPYRIGHT 2003 ACS on STN  
2003:510153 Document No. 139:77168 Sulfonated polyarylene composition  
and proton-conductive **membrane**. Okaniwa, Motoki; Goto,  
Kohei (JSR Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2003183526 A2  
20030703, 13 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP  
2001-391748 20011225.
- AB The compn. contains a sulfonated polyarylene, a hindered phenol with  
mol. wt. .gtoreq.500, and a hindered amine with mol. wt.  
.gtoreq.500. The proton-conductive **membrane**, useful as a  
solid electrolyte in a **fuel cell**, etc., is made  
of the compn. showing resistance to oxidn. and mech. strength.
- IT 463963-71-5DP, Bisphenol AF-4,4'-dichlorobenzophenone-2,5-  
dichloro-4'-(4-phenoxy)phenoxybenzophenone copolymer,  
**sulfonated**  
(**sulfonated** polyarylene compn. contg. hindered phenol  
and hindered amine antioxidants for proton-conductive  
**membrane**)
- RN 463963-71-5 ZCAPLUS  
CN Methanone, bis(4-chlorophenyl)-, polymer with (2,5-dichlorophenyl)[4-  
(4-phenoxyphenoxy)phenyl]methanone and 4,4'-[2,2,2-trifluoro-1-  
(trifluoromethyl)ethylidene]bis[phenol] (9CI) (CA INDEX NAME)
- CM 1
- CRN 463954-50-9  
CMF C25 H16 Cl2 O3



CM 2

CRN 1478-61-1

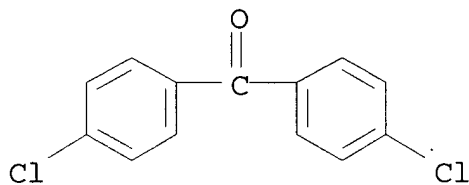
CMF C15 H10 F6 O2



CM 3

CRN 90-98-2

CMF C13 H8 Cl2 O



IC ICM C08L101-06

ICS C08K005-13; C08K005-3435; H01B001-06; H01M008-02

CC 76-2 (Electric Phenomena)

Section cross-reference(s): 38

ST sulfonated polyarylene compn proton conductive **membrane**;  
 hindered phenol antioxidant sulfonated polyarylene; amine hindered  
 antioxidant sulfonated polyarylene

IT Amines, uses

Phenols, uses

(hindered; sulfonated polyarylene compn. contg. hindered phenol  
 and hindered amine antioxidants for proton-conductive  
**membrane**)

IT Polyoxyarylenes

(polyketone-; sulfonated polyarylene compn. contg. hindered  
 phenol and hindered amine antioxidants for proton-conductive  
**membrane**)

IT Ionic conductors

(polymeric, protonic; sulfonated polyarylene compn. contg.  
 hindered phenol and hindered amine antioxidants for  
 proton-conductive **membrane**)

IT Polyketones

(polyoxyarylene-; sulfonated polyarylene compn. contg. hindered phenol and hindered amine antioxidants for proton-conductive **membrane**)

IT Antioxidants

(sulfonated polyarylene compn. contg. hindered phenol and hindered amine antioxidants for proton-conductive **membrane**)

IT 7664-93-9DP, Sulfuric acid, polyarylene sulfonate with 364062-39-5DP, 4,4'-Dichlorobenzophenone-2,5-dichloro-4'-phenoxybenzophenone copolymer, sulfonated **463963-71-5DP**, Bisphenol AF-4,4'-dichlorobenzophenone-2,5-dichloro-4'-(4-phenoxy)phenoxybenzophenone copolymer, **sulfonated** (**sulfonated** polyarylene compn. contg. hindered phenol and hindered amine antioxidants for proton-conductive **membrane**)

IT 1455-42-1D, 3,9-Bis(2-hydroxy-1,1-dimethylethyl)-2,4,8,10-tetraoxaspiro[5.5]undecane, mixed ester 1703-58-8D, 1,2,3,4-Butanetetracarboxylic acid, mixed ester 1709-70-2, 1,3,5-Trimethyl-2,4,6-tris[3,5-di(tert-butyl)-4-hydroxybenzyl]benzene 2403-89-6D, 1,2,2,6,6-Pentamethyl-4-piperidinol, mixed ester 10563-26-5D, N,N'-Bis(3-aminopropyl)ethylenediamine, reaction product with triazine 27676-62-6, Tris[3,5-di(tert-butyl)-4-hydroxybenzyl] isocyanurate 75720-76-2D, reaction product with bisaminopropylethylenediamine (sulfonated polyarylene compn. contg. hindered phenol and hindered amine antioxidants for proton-conductive **membrane**)

L20 ANSWER 7 OF 22 ZCAPLUS COPYRIGHT 2003 ACS on STN

2003:390015 Document No. 138:370097 Sulfonated fluorine-containing polymers, their compositions, and polyelectrolyte **membranes** therefrom. Sakaguchi, Yoshimitsu; Takase, Satoshi; Kobase, Shigetsugu; Gomi, Tomonori; Okumura, Yasunori; Omote, Kazushi (Toyobo Co., Ltd., Japan; Nippon Shokubai Co., Ltd.). Jpn. Kokai Tokkyo Koho JP 2003147076 A2 20030521, 17 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2001-352043 20011116.

AB The polymers, having superior heat resistance and high ion cond., have (i) Ar1OAr2O [Ar1 = [halo- and/or lower alkyl(oxy)-substituted] C6H4AC6H4 (A = ketone, sulfone; .gtoreq.1 H of C6H4 is substituted with F); Ar2 = C6H4BC6H4 (B = single bond, sulfone, ketone, ether, C1-6 alkylidene; .gtoreq.1 H of C6H4 is substituted with F);] and (ii) Ar1OAr3O [Ar3 = sulfonated 9,9-bis(4-hydroxyphenyl)fluorenediylderivs., sulfonated 9,9-bis(4-hydroxyethoxyphenyl)fluorenediyl derivs., or sulfonated bis(4-hydroxyphenyl)mono- or diphenylmethanediyl derivs., each arom. ring has one sulfonyl group (Markush given)]. Thus, 9,9-bis(4-hydroxyphenyl)fluorene 0.50, bis(4-hydroxyphenyl)sulfone 0.54, and bis(pentafluorophenyl)ketone 1.30 g g were copolymd. and sulfonated with conc. H2SO4 to give a polymer, which formed a 15-.mu.m-thick cast film showing ion cond. 0.12 S/cm and 3% wt. loss temp. 301.degree..

IT **524674-87-1DP**, 9,9-Bis(4-hydroxyphenyl)fluorene-2,2-bis(4-

hydroxyphenyl)hexafluoropropane-bis(pentafluorophenyl) ketone  
copolymer, **sulfonated**

(9,9-Bis(4-hydroxyphenyl)fluorene-2,2-bis(4-hydroxyphenyl)hexafluoropropane-bis(pentafluorophenyl) ketone  
copolymer; **sulfonated** polyoxyarylene electrolytic  
**membranes** having high ion cond. and heat stability for  
**fuel cells**)

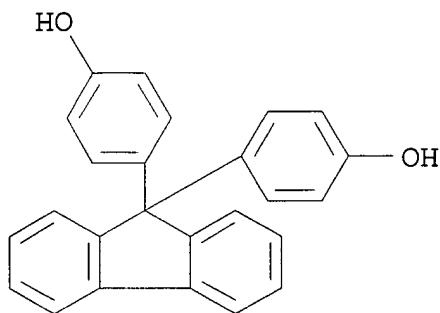
RN 524674-87-1 ZCAPLUS

CN Methanone, bis(pentafluorophenyl)-, polymer with  
4,4'-(9H-fluoren-9-ylidene)bis[phenol] and 4,4'-[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis[phenol] (9CI) (CA INDEX NAME)

CM 1

CRN 3236-71-3

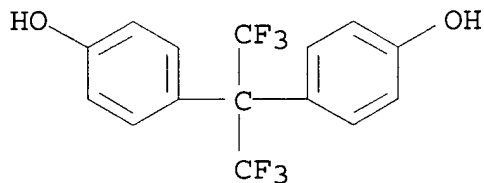
CMF C25 H18 O2



CM 2

CRN 1478-61-1

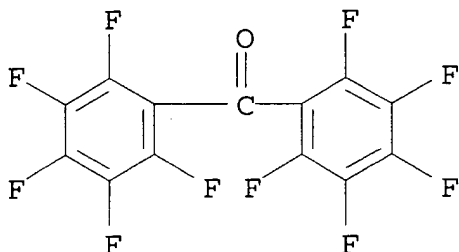
CMF C15 H10 F6 O2



CM 3

CRN 853-39-4

CMF C13 F10 O



- IC ICM C08G065-48  
ICS C08J005-22; H01B001-06; H01M008-02; H01M008-10; C08L071-00
- CC 38-3 (Plastics Fabrication and Uses)  
Section cross-reference(s): 52
- ST sulfonated polyoxyarylene polysulfone electrolyte **membrane**  
heat resistance; hydroxyphenylfluorene hydroxyphenylsulfone  
perfluorophenyl ketone copolymer polyelectrolyte
- IT Fluoropolymers, uses  
(cardo, polyketone-polyoxyphenylene-polysulfones, sulfonated;  
sulfonated polyoxyarylene electrolytic **membranes** having  
high ion cond. and heat stability for **fuel**  
**cells**)
- IT Cardo polymers  
(fluorine-contg., polyketone-polyoxyphenylene-polysulfones,  
sulfonated; sulfonated polyoxyarylene electrolytic  
**membranes** having high ion cond. and heat stability for  
**fuel cells**)
- IT **Fuel cell** electrolytes  
Heat-resistant materials  
(polyelectrolytes; sulfonated polyoxyarylene electrolytic  
**membranes** having high ion cond. and heat stability for  
**fuel cells**)
- IT Polyoxyphenylenes  
(polyketone-, cardo, fluorine-contg., sulfonated; sulfonated  
polyoxyarylene electrolytic **membranes** having high ion  
cond. and heat stability for **fuel cells**)
- IT Polysulfones, uses  
(polyketone-polyoxyphenylene-, cardo, fluorine-contg.,  
sulfonated; sulfonated polyoxyarylene electrolytic  
**membranes** having high ion cond. and heat stability for  
**fuel cells**)
- IT Cardo polymers  
(polyketone-polyoxyphenylenes, fluorine-contg., sulfonated;  
sulfonated polyoxyarylene electrolytic **membranes** having  
high ion cond. and heat stability for **fuel**  
**cells**)
- IT Polyoxyphenylenes  
(polyketone-polysulfone-, cardo, fluorine-contg., sulfonated;  
sulfonated polyoxyarylene electrolytic **membranes** having  
high ion cond. and heat stability for **fuel**  
**cells**)
- IT Polyketones



(polyoxyphenylene-, cardo, fluorine-contg., sulfonated; sulfonated polyoxyarylene electrolytic **membranes** having high ion cond. and heat stability for **fuel cells**)

IT Polyketones

(polyoxyphenylene-polysulfone-, cardo, fluorine-contg., sulfonated; sulfonated polyoxyarylene electrolytic **membranes** having high ion cond. and heat stability for **fuel cells**)

IT Polyelectrolytes

(sulfonated polyoxyarylene electrolytic **membranes** having high ion cond. and heat stability for **fuel cells**)

IT 524674-87-1DP, 9,9-Bis(4-hydroxyphenyl)fluorene-2,2-bis(4-hydroxyphenyl)hexafluoropropane-bis(pentafluorophenyl) ketone copolymer, **sulfonated**

(9,9-Bis(4-hydroxyphenyl)fluorene-2,2-bis(4-hydroxyphenyl)hexafluoropropane-bis(pentafluorophenyl) ketone copolymer; **sulfonated** polyoxyarylene electrolytic **membranes** having high ion cond. and heat stability for **fuel cells**)

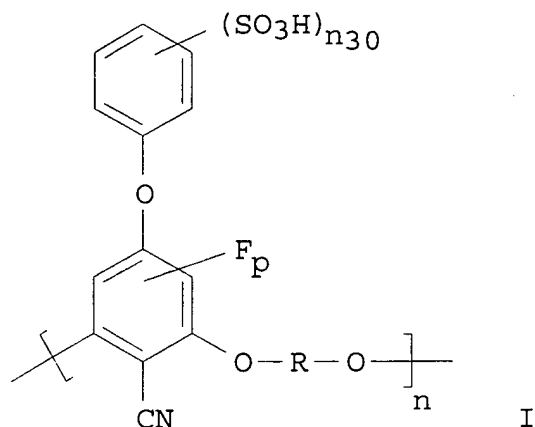
IT 524674-86-0DP, 9,9-Bis(4-hydroxyphenyl)fluorene-bis(4-hydroxyphenyl) sulfone-bis(pentafluorophenyl) ketone copolymer, **sulfonated**

(sulfonated polyoxyarylene electrolytic **membranes** having high ion cond. and heat stability for **fuel cells**)

L20 ANSWER 8 OF 22 ZCAPLUS COPYRIGHT 2003 ACS on STN

2003:386791 Document No. 138:386506 Sulfonated fluoropolymers, their resin compositions, and **fuel cell** electrolytes therefrom. Sakaguchi, Yoshimitsu; Kaji, Atsushi; Takase, Satoshi; Kimura, Kunio; Gomi, Tomonori; Okumura, Yasunori; Omote, Kazushi (Toyobo Co., Ltd., Japan; Nippon Shokubai Co., Ltd.). Jpn. Kokai Tokkyo Koho JP 2003147075 A2 20030521, 28 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2001-352042 20011116.

GI



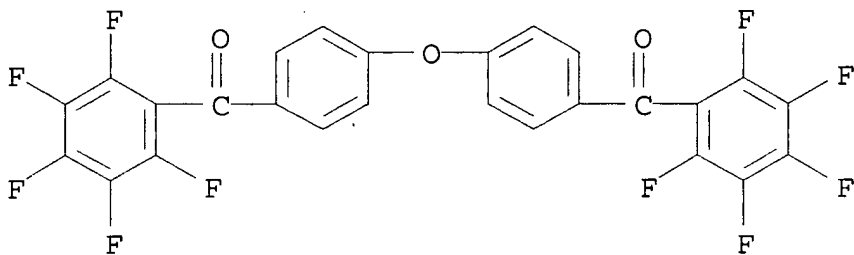
AB The polymers have repeating unit (C<sub>6</sub>H<sub>4</sub>mFmCOC<sub>6</sub>H<sub>4</sub>-qXqOC<sub>6</sub>H<sub>4</sub>-q'X'q'COC<sub>6</sub>H<sub>4</sub>-m'Fm'ORO) [m, m' = 0-4 (m + m' = 1-8); X, X' = halo, C1-6 alkyl(oxy); q, q' = 0-4; R = sulfonated bivalent residues of (hexafluoro)bisphenol A, bisphenol TP, bisphenol F, 9,9-bis[4-hydroxy(-3-methyl)phenyl]fluorene, etc. (Markush given)], or are represented by I (p = 1, 2; R = the same to above). Thus, 2.0 g 4,4'-bis(2,3,4,5,6-pentafluorobenzoyl)diphenyl ether was copolymd. with 1.25 g 9,9-bis(4-hydroxyphenyl)fluorene and sulfonated with conc. H<sub>2</sub>SO<sub>4</sub> to give a polymer, which formed a 15-.mu.m-thick cast film showing ion cond. 0.10 S/cm and 3% wt. loss temp. 310.degree..

IT **213693-06-2DP, sulfonated 213693-07-3DP, sulfonated**  
(**sulfonated** fluoropolymers forming heat-stable polyelectrolyte **membranes** for **fuel cells**)

RN 213693-06-2 ZCAPLUS  
CN Methanone, (oxydi-4,1-phenylene)bis[(pentafluorophenyl)-, polymer with 4,4'-[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis[phenol] (9CI) (CA INDEX NAME)

CM 1

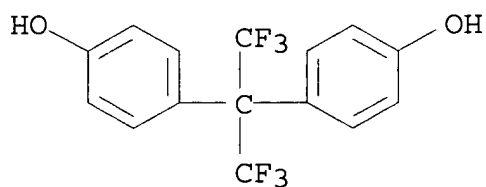
CRN 213693-03-9  
CMF C26 H8 F10 O3



CM 2

CRN 1478-61-1

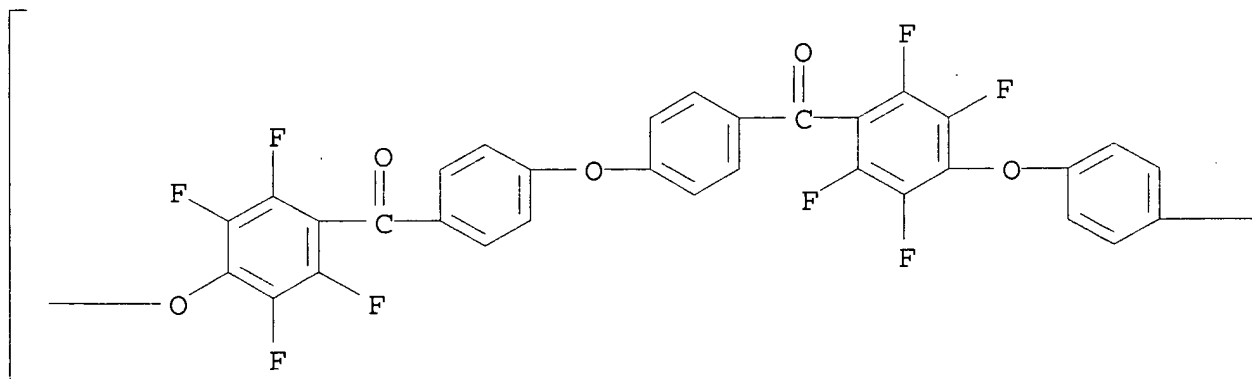
CMF C15 H10 F6 O2



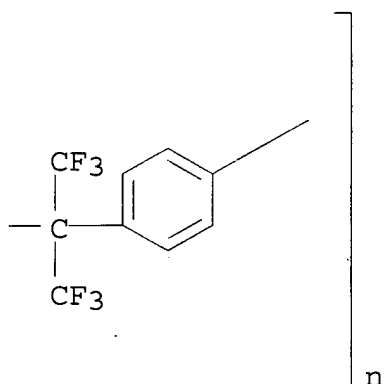
RN 213693-07-3 ZCAPLUS

CN Poly[oxy(2,3,5,6-tetrafluoro-1,4-phenylene)carbonyl-1,4-phenyleneoxy-1,4-phenylenecarbonyl(2,3,5,6-tetrafluoro-1,4-phenylene)oxy-1,4-phenylene[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]-1,4-phenylene] (9CI) (CA INDEX NAME)

PAGE 1-A



PAGE 1-B



- IC ICM C08G065-40  
ICS H01B001-06; H01M008-02; H01M008-10
- CC 38-3 (Plastics Fabrication and Uses)  
Section cross-reference(s): 52
- ST hydroxyphenylfluorene fluorobenzoyldiphenyl ether polyelectrolyte  
**fuel cell**; heat stable polyelectrolyte sulfonated  
cardo fluoropolymer; sulfonated phenoxyfluorobenzonitrile  
hydroxyphenylfluorene electrolytic **membrane**
- IT Fluoropolymers, uses  
(cardo, cyano, polyoxyarylenes; properly sulfonated  
fluoropolymers forming heat-stable polyelectrolyte  
**membranes for fuel cells**)
- IT Polyoxyarylenes  
(cardo, fluorine-contg., sulfonated; properly sulfonated  
fluoropolymers forming heat-stable polyelectrolyte  
**membranes for fuel cells**)
- IT Cardo polymers  
(fluorine-contg., cyano, polyoxyarylenes; properly sulfonated  
fluoropolymers forming heat-stable polyelectrolyte  
**membranes for fuel cells**)
- IT Cardo polymers  
(polyoxyarylenes, fluorine-contg., sulfonated; properly  
sulfonated fluoropolymers forming heat-stable polyelectrolyte  
**membranes for fuel cells**)
- IT **Fuel cell** electrolytes  
Heat-resistant materials  
Polyelectrolytes  
(sulfonated fluoropolymers forming heat-stable polyelectrolyte  
**membranes for fuel cells**)
- IT Fluoropolymers, uses  
(sulfonated; sulfonated fluoropolymers forming heat-stable  
polyelectrolyte **membranes for fuel**  
**cells**)
- IT 213693-06-2DP, sulfonated 213693-07-3DP,  
**sulfonated** 213693-10-8DP, sulfonated 213693-11-9DP,  
sulfonated 343310-32-7DP, sulfonated 343310-33-8DP, sulfonated

524932-24-9DP, sulfonated 524945-32-2DP, sulfonated  
(**sulfonated** fluoropolymers forming heat-stable  
polyelectrolyte **membranes** for fuel  
cells)

L20 ANSWER 9 OF 22 ZCAPLUS COPYRIGHT 2003 ACS on STN

2003:299029 Document No. 138:305286 Manufacture of branched  
polyarylene polymers with high toughness, their sulfonated products,  
and proton-conducting **membranes**. Takahashi, Masayuki;  
Yamakawa, Yoshitaka; Futami, Satoshi; Goto, Kohei (JSR Ltd., Japan).  
Jpn. Kokai Tokkyo Koho JP 2003113226 A2 20030418, 21 pp.  
(Japanese). CODEN: JKXXAF. APPLICATION: JP 2001-307430 200111003.

AB The branched polyarylene polymers are manufd. by copolymn. of (A)  
monomers contg. XC6R4AC6R4X (X = Cl, Br, I; A = electron-withdrawing  
group; R = H, F, alkyl, fluoroalkyl), XC6R4AC6R4OC6R4AC6R4X, and/or  
X(C6R4AC6R4B)nC6R4AC6R4X (B = electron-donating group, divalent  
group; n .gtoreq.2) and (B) monomers contg. X2C6R3A(C6R4B)mZ (Z =  
aryl; m = 0, 1, 2), X-p-C6R4X, X-p-C6R4-p-C6R4X, and/or  
1,3-X-disubstituted C6R4 in the presence of (C) branching agents  
contg. C6R'5AC6R'5 (R' = H, Cl, Br, I, F, alkyl, fluoroalkyl,  
.gtoreq.3 of R' = Cl, Br, I), C6R'5AC6R'4OC6R'4AC6R'5,  
R'(C6R'4AC6R'4B)nC6R'4AC6R'5, C6R'6, and/or C6R'5C6R'5. The  
proton-conducting **membranes**, useful for battery  
electrolytes, etc., are prepd. by sulfonation of the branched  
polyarylene polymers with sulfonating agents. Thus, polymn. of  
2,5-dichloro-4-phenoxybenzophenone 178, 2,4,4'-trichlorobenzophenone  
2.0, 4,4'-dichlorobenzophenone 16, and 4-chlorobenzophenone 4.0 mmol  
gave a copolymer with Mw 146,000, which was sulfonated, dissolved in  
1:1 vol NMP and methanol, cast, and dried to give a film with no  
tackiness and good surface smoothness.

IT 509075-82-5DP, reaction products with chlorobenzophenone,  
**sulfonated** 509075-83-6DP, reaction products with  
chlorobenzophenone, **sulfonated**

(manuf. of **sulfonated** branched polyarylene polymers  
with high toughness for proton-conducting **membranes**)

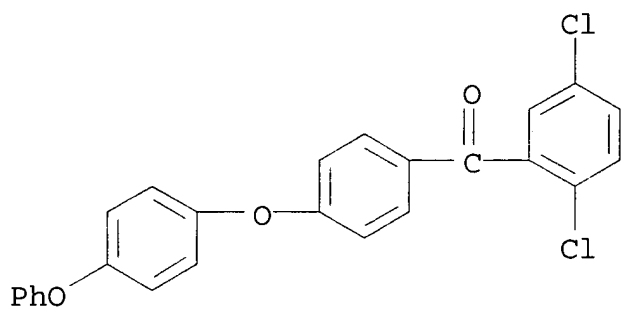
RN 509075-82-5 ZCAPLUS

CN Methanone, bis(4-chlorophenyl)-, polymer with (4-chlorophenyl)(2,4-  
dichlorophenyl)methanone, (2,5-dichlorophenyl)[4-(4-  
phenoxyphenoxy)phenyl]methanone and 4,4'-[2,2,2-trifluoro-1-  
(trifluoromethyl)ethylidene]bis[phenol] (9CI) (CA INDEX NAME)

CM 1

CRN 463954-50-9

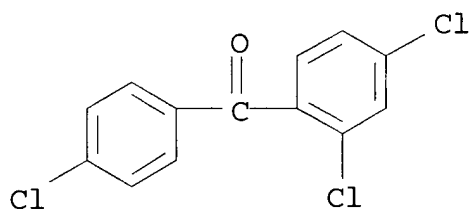
CMF C25 H16 Cl2 O3



CM 2

CRN 33146-57-5

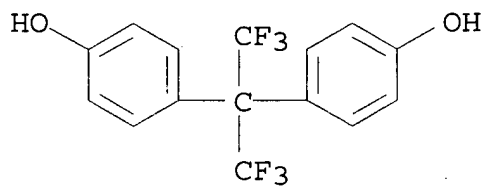
CMF C13 H7 Cl3 O



CM 3

CRN 1478-61-1

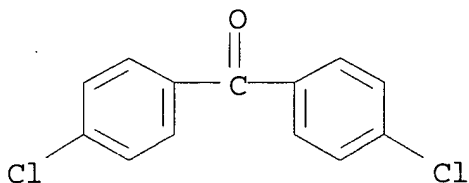
CMF C15 H10 F6 O2



CM 4

CRN 90-98-2

CMF C13 H8 Cl2 O



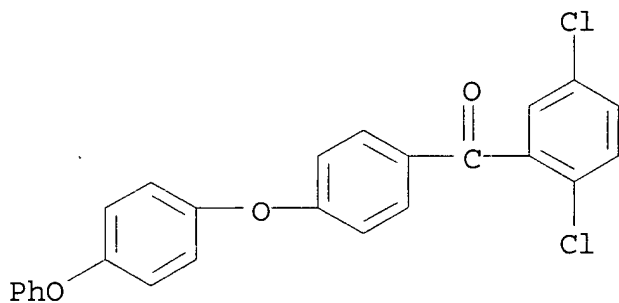
RN 509075-83-6 ZCAPLUS

CN Methanone, [[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis(4,1-phenyleneoxy-4,1-phenylene)]bis[(4-chlorophenyl)-, polymer with (4-chlorophenyl) (2,4-dichlorophenyl)methanone and (2,5-dichlorophenyl) [4-(4-phenoxyphenoxy)phenyl]methanone (9CI) (CA INDEX NAME)

CM 1

CRN 463954-50-9

CMF C25 H16 Cl2 O3

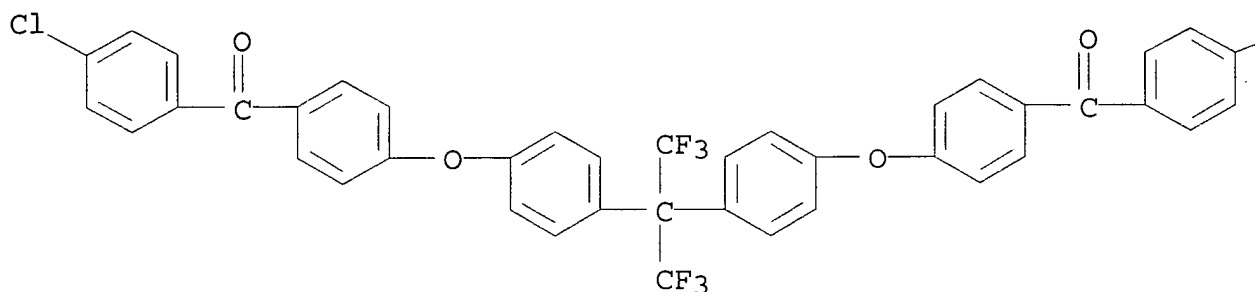


CM 2

CRN 389634-34-8

CMF C41 H24 Cl2 F6 O4

PAGE 1-A



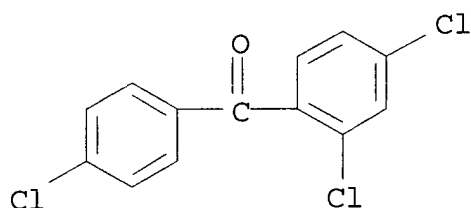
PAGE 1-B

Cl

CM 3

CRN 33146-57-5

CMF C13 H7 Cl3 O



- IC ICM C08G061-12  
ICS C08J005-18; H01B001-06; H01M008-02; H01M006-18; H01M010-40;  
C08L065-00
- CC 38-3 (Plastics Fabrication and Uses)  
Section cross-reference(s): 52
- ST branch polyarylene polyether polyketone proton conducting  
**membrane**; chlorophenoxybenzophenone chlorobenzophenone  
polymer sulfonation battery electrode
- IT Battery electrolytes  
(manuf. of sulfonated branched polyarylene polymers with high  
toughness for proton-conducting **membranes**)
- IT Polyketones  
(polyether-, fluorine-contg.; manuf. of sulfonated branched  
polyarylene polymers with high toughness for proton-conducting  
**membranes**)
- IT Polyketones



- (polyether-; manuf. of sulfonated branched polyarylene polymers with high toughness for proton-conducting **m mbranes**)
- IT Fluoropolymers, uses  
(polyether-polyketone-; manuf. of sulfonated branched polyarylene polymers with high toughness for proton-conducting **membranes**)
- IT Polyethers, uses  
(polyketone-, fluorine-contg.; manuf. of sulfonated branched polyarylene polymers with high toughness for proton-conducting **membranes**)
- IT Polyethers, uses  
(polyketone-; manuf. of sulfonated branched polyarylene polymers with high toughness for proton-conducting **membranes**)
- IT Ionic conductors  
(protonic; manuf. of sulfonated branched polyarylene polymers with high toughness for proton-conducting **membranes**)
- IT 69266-28-0P 122325-09-1P, 4,4'-Dichlorobenzophenone-hexafluorobisphenol A copolymer  
(manuf. of sulfonated branched polyarylene polymers with high toughness for proton-conducting **membranes**)
- IT 134-85-0DP, 4-Chlorobenzophenone, reaction products with polyarylene-polyether-polyketones, sulfonated **509075-82-5DP**, reaction products with chlorobenzophenone, **sulfonated 509075-83-6DP**, reaction products with chlorobenzophenone, **sulfonated 509075-84-7DP**, reaction products with chlorobenzophenone, sulfonated  
(manuf. of **sulfonated** branched polyarylene polymers with high toughness for proton-conducting **membranes**)

L20 ANSWER 10 OF 22 ZCAPLUS COPYRIGHT 2003 ACS on STN  
2003:216958 Document No. 138:239119 Crosslinked polymer electrolytes with high proton conductivity and durability and their manufacture. Okaniwa, Motoki; Goto, Kohei (JSR Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2003082012 A2 20030319, 19 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2001-275421 20010911.

- AB The polymer electrolytes for **fuel cell** proton-conductive **membranes**, battery electrolytes, displays, sensors, capacitors, ion-exchange **membranes**, etc., are manufd. by polymg. monomers having .gtoreq.2 radical-polymerizable groups in the presence of proton-conductive polymers and have insoly. to N-methylpyrrolidone .gtoreq.40%. Thus, bisphenol AF-4,4'-dichlorobenzophenone oligomer was reacted with 2,5-dichloro-4'-(4-phenoxy)phenoxybenzophenone to give a copolymer, which was reacted with H2SO4. A mixt. contg. the sulfonated polymer and Kayarad DPHA (dipentaerythritol hexaacrylate-dipentaerythritol pentaacrylate mixt.) was processed to give a crosslinked polymer film showing high proton cond. and tensile strength.
- IT **463963-71-5DP**, Bisphenol AF-4,4'-dichlorobenzophenone-2,5-dichloro-4'-(4-phenoxy)phenoxybenzophenone copolymer, **sulfonat d**  
(dipentaerythritol hexaacrylate- and dipentaerythritol pentaacrylate-crosslinked; crosslinked polymer electrolytes with

high proton cond. and durability and their manuf.)

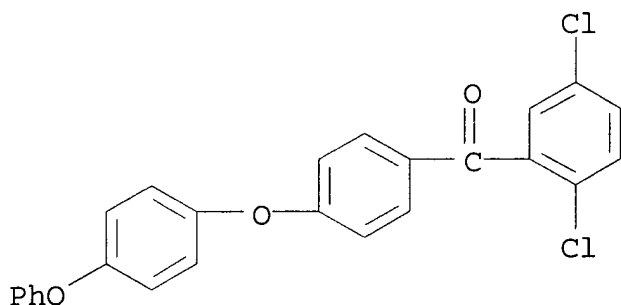
RN 463963-71-5 ZCAPLUS

CN Methanone, bis(4-chlorophenyl)-, polymer with (2,5-dichlorophenyl)[4-(4-phenoxyphenoxy)phenyl]methanone and 4,4'-[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis[phenol] (9CI) (CA INDEX NAME)

CM 1

CRN 463954-50-9

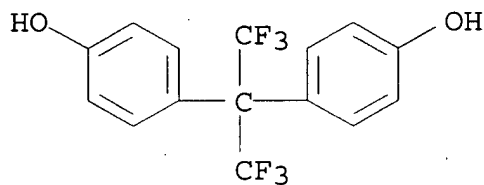
CMF C25 H16 Cl2 O3



CM 2

CRN 1478-61-1

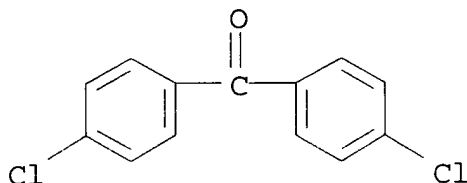
CMF C15 H10 F6 O2



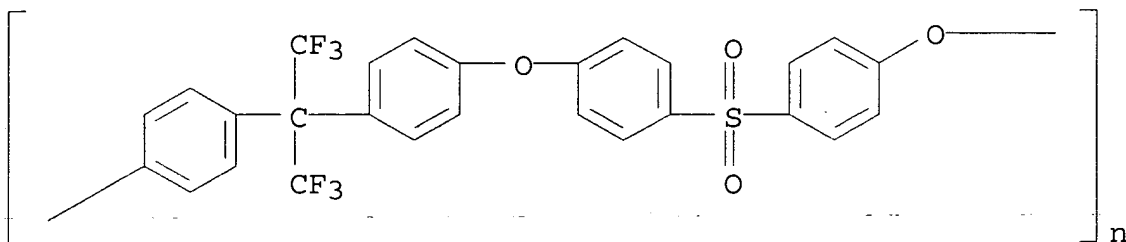
CM 3

CRN 90-98-2

CMF C13 H8 Cl2 O



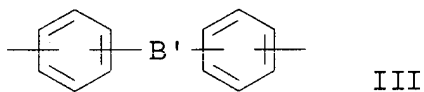
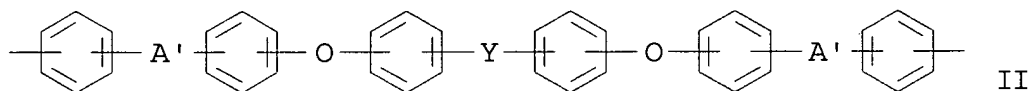
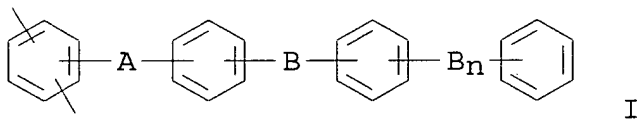
- IC ICM C08F002-44  
ICS C08F283-00; H01B001-06; H01B013-00; H01M008-02; H01M008-10
- CC 38-3 (Plastics Fabrication and Uses)  
Section cross-reference(s): 52, 76
- IT 364062-39-5DP, 4,4'-Dichlorobenzophenone-2,5-dichloro-4'-phenoxybenzophenone copolymer, sulfonated **463963-71-5DP**, Bisphenol AF-4,4'-dichlorobenzophenone-2,5-dichloro-4'-(4-phenoxy)phenoxybenzophenone copolymer, **sulfonated**  
(dipentaerythritol hexaacrylate- and dipentaerythritol pentaacrylate-crosslinked; crosslinked polymer electrolytes with high proton cond. and durability and their manuf.)
- L20 ANSWER 11 OF 22 ZCAPLUS COPYRIGHT 2003 ACS on STN  
2003:211147 Document No. 138:402342 Sulfonated poly(arylene ether sulfones) containing hexafluoroisopropylidene unit: Influence of sulfonic acid position on stability and other properties. Harrison, William L.; Wang, Feng; O'Connor, Kerry; Arnett, Natalie Y.; Kim, Yu Seung; McGrath, J. E. (Department of Chemistry and the Materials Research Institute, Virginia Polytechnic Institute and State University, Blacksburg, VA, 24061, USA). Polymer Preprints (American Chemical Society, Division of Polymer Chemistry), 44(1), 849 (English) 2003. CODEN: ACPPAY. ISSN: 0032-3934. Publisher: American Chemical Society, Division of Polymer Chemistry.
- AB Sulfonated poly(arylene ether sulfones) were prepd. sulfonation of the polymer, and by copolymn. of the disulfonated dichlorodiphenyl sulfone. The effect of the sulfo group position on polymer properties was investigated.
- IT **31694-07-2DP, sulfonated**  
(effect of sulfo group position on properties of sulfonated polyether-polysulfones contg. hexafluoroisopropylidene unit)
- RN 31694-07-2 ZCAPLUS
- CN Poly[oxy-1,4-phenylenesulfonyl-1,4-phenyleneoxy-1,4-phenylene[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]-1,4-phenylene] (9CI) (CA . INDEX NAME)



CC 35-8 (Chemistry of Synthetic High Polymers)  
 IT **31694-07-2DP, sulfonated** 90884-65-4DP, Bisphenol  
 AF-4,4'-dichlorodiphenyl sulfone copolymer, sulfonated  
 (effect of sulfo group position on properties of sulfonated  
 polyether-polysulfones contg. hexafluoroisopropylidene unit)

L20 ANSWER 12 OF 22 ZCAPLUS COPYRIGHT 2003 ACS on STN  
 2003:6295 Document No. 138:76114 Electrode catalyst-electrolyte  
 laminate for polymer electrolyte **fuel cell**.  
 Mitsuta, Naoki; Kanaoka, Nagayuki; Asano, Yoichi; Sohma, Hiroshi  
 (Honda Giken Kogyo Kabushiki Kaisha, Japan). PCT Int. Appl. WO  
 2003001622 A1 20030103, 47 pp. DESIGNATED STATES: W: CA, DE, US.  
 (Japanese). CODEN: PIXXD2. APPLICATION: WO 2002-JP6222 20020621.  
 PRIORITY: JP 2001-190735 20010625; JP 2001-237042 20010803.

GI



AB The laminate has a polymer electrolyte layer between 2 electrode  
 catalyst layers, where the electrolyte is a sulfonated polymer,

having a main chain of bivalent arom. groups connected directly or by oxy group or non-arom. bivalent groups, and arom. side chain, that can be sulfonated. Preferably, the main chain has repeating units I (A = electron attracting group, B = electron donor group, n = 0 or 1, and the benzene ring may have substituents), II (A' = electron attracting group, Y = -C(CF<sub>3</sub>)<sub>2</sub>-, or -SO<sub>2</sub>-, and the benzene ring may have substituents), and optionally III (B' = electron donor group).

IT 463963-68-0D, sulfonated 463963-70-4D,  
sulfonated

(structure of **sulfonated** arom. copolymer electrolytes for laminate with electrolyte catalysts for **fuel cells**)

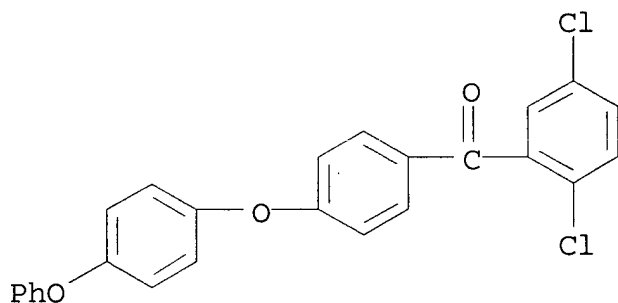
RN 463963-68-0 ZCAPLUS

CN Methanone, [[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis(4,1-phenyleneoxy-4,1-phenylene)]bis[(4-chlorophenyl)-, polymer with (2,5-dichlorophenyl) [4-(4-phenoxyphenoxy)phenyl]methanone (9CI) (CA INDEX NAME)

CM 1

CRN 463954-50-9

CMF C25 H16 Cl2 O3

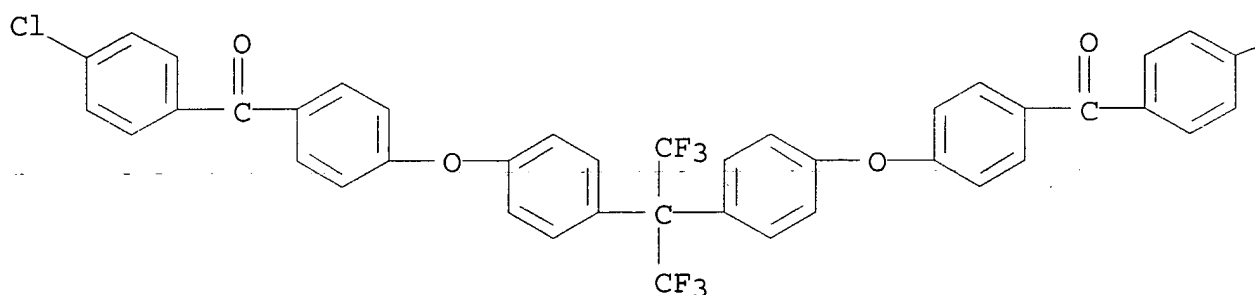


CM 2

CRN 389634-34-8

CMF C41 H24 Cl2 F6 O4

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PAGE 1-B

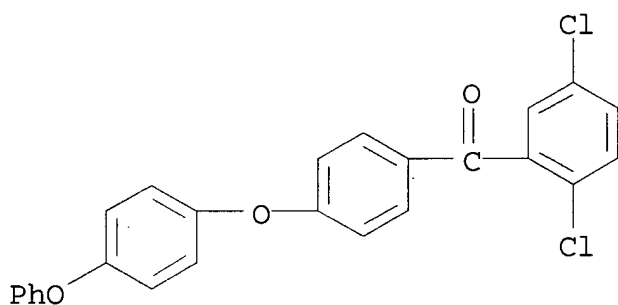
Cl

RN 463963-70-4 ZCAPLUS  
 CN Methanone, [[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis(4,1-phenyleneoxy-4,1-phenylene)]bis[(4-chlorophenyl)-, polymer with bis(4-chlorophenyl)methanone and (2,5-dichlorophenyl)[4-(4-phenoxyphenoxy)phenyl]methanone (9CI) (CA INDEX NAME)

CM 1

CRN 463954-50-9

CMF C25 H16 Cl2 O3

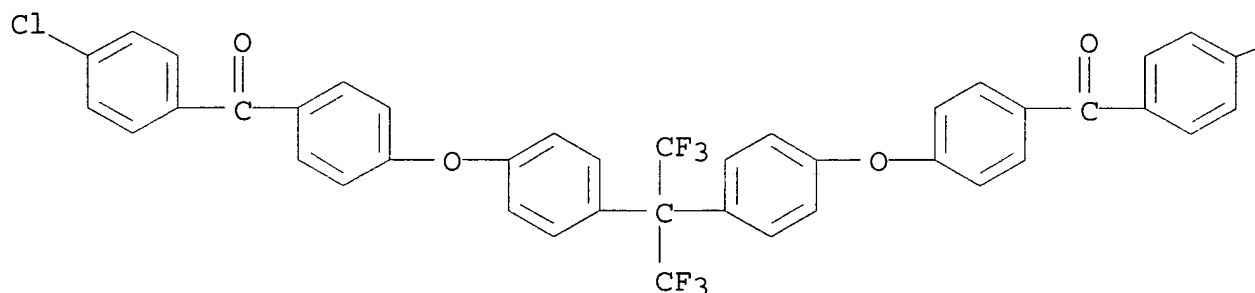


CM 2

CRN 389634-34-8

CMF C41 H24 Cl2 F6 O4

PAGE 1-A



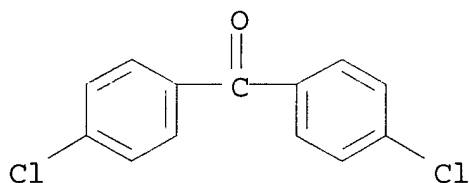
PAGE 1-B



CM 3

CRN 90-98-2

CMF C13 H8 Cl2 O

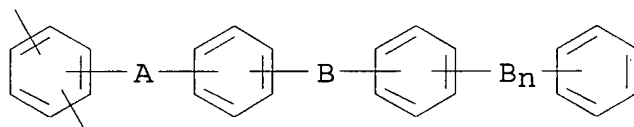


- IC ICM H01M008-02  
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)  
 ST sulfonated arom polymer electrolyte **fuel cell**;  
 electrode catalyst polymer electrolyte laminate **fuel cell**  
 IT **Fuel cells**  
 (structure of sulfonated arom. copolymer electrolytes for laminate with electrolyte catalysts for **fuel cells**)  
 IT Carbon black, uses  
 (structure of sulfonated arom. copolymer electrolytes for laminate with electrolyte catalysts for **fuel cells**)  
 IT 7440-06-4, Platinum, uses  
 (structure of sulfonated arom. copolymer electrolytes for laminate with electrolyte catalysts for **fuel cells**)

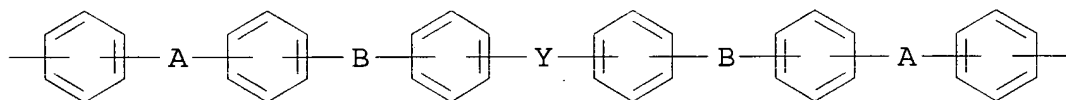
IT 41206-07-9D, sulfonated **463963-68-0D, sulfonated**  
**463963-70-4D, sulfonated**  
 (structure of **sulfonated** arom. copolymer electrolytes  
 for laminate with electrolyte catalysts for **fuel**  
**cells**)

L20 ANSWER 13 OF 22 ZCAPLUS COPYRIGHT 2003 ACS on STN  
 2002:964684 Document No. 138:42043 Electrode/electrolyte laminate for  
 polymer electrolyte **fuel cell**, its manufacture,  
 and the **fuel cell**. Nanaumi, Masaaki; Asano,  
 Yoichi; Kanaoka, Nagayuki; Sohma, Hiroshi; Mitsuta, Naoki (Honda  
 Giken Kogyo Kabushiki Kaisha, Japan). PCT Int. Appl. WO 2002101860  
 A1 20021219, 75 pp. DESIGNATED STATES: W: CA, DE, US. (Japanese).  
 CODEN: PIXXD2. APPLICATION: WO 2002-JP5728 20020610. PRIORITY: JP  
 2001-175042 20010611; JP 2001-176695 20010612; JP 2001-180639  
 20010614; JP 2001-233023 20010801; JP 2001-242592 20010809.

GI



I



II

AB The laminate has a polymer electrolyte **membrane** held  
 between a pair of electrode catalyst layers, where the polymer  
 electrolyte is a sulfonated hydrocarbon polymer, having a main chain  
 of benzene rings connected directly or via bivalent org. groups.  
 Preferably, the polymer is a copolymer contg. units I (A = electron  
 attracting group, B = electron donor group, n = 0 or 1, and the  
 benzene ring may be a deriv. of a benzene ring) and II [Y =  
 -C(CF<sub>3</sub>)<sub>2</sub>- or -SO<sub>2</sub>-]; and the catalyst layers contain 0.01-0.8 mg  
 Pt/cm<sup>2</sup> with a carbonaceous support having av. particle diam 10-100  
 nm. The laminate is prep'd. by stacking the catalyst layers with the  
 electrolyte **membrane**, and passing a .gtoreq.0.1 A/cm<sup>2</sup>  
 current for .gtoreq.5 h in a .gtoreq.60% humidity atm.

IT **478703-76-3D, sulfonated**  
 (structure and manuf. of electrode/polymer electrolyte laminates  
 for **fuel c lls**)

RN 478703-76-3 ZCAPLUS

CN Methanone, [[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis(4,1-  
 phenyleneoxy-4,1-phenylene)]bis[(4-chlorophenyl)-, polymer with



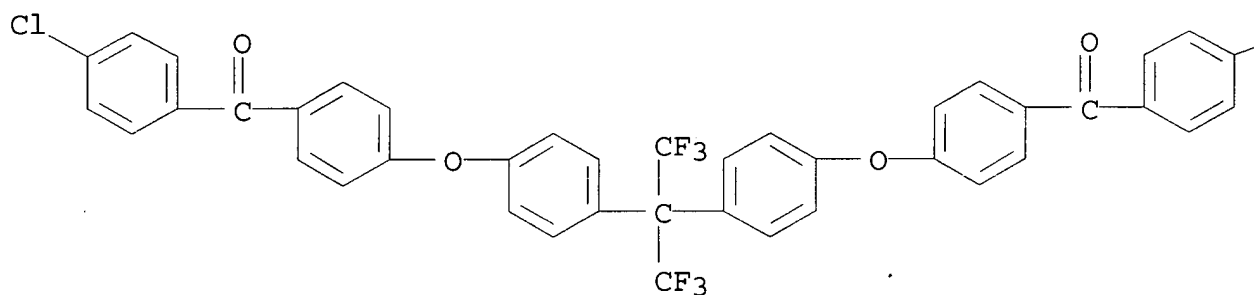
(2,5-dichlorophenyl) (4-phenoxyphenyl) methanone (9CI) (CA INDEX NAME)

CM 1

CRN 389634-34-8

CMF C41 H24 Cl2 F6 O4

PAGE 1-A



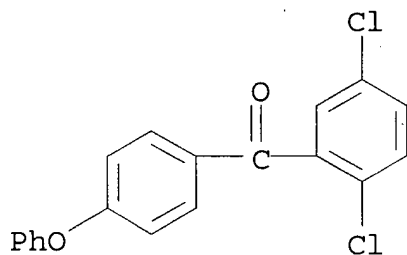
PAGE 1-B

Cl

CM 2

CRN 151173-25-0

CMF C19 H12 Cl2 O2

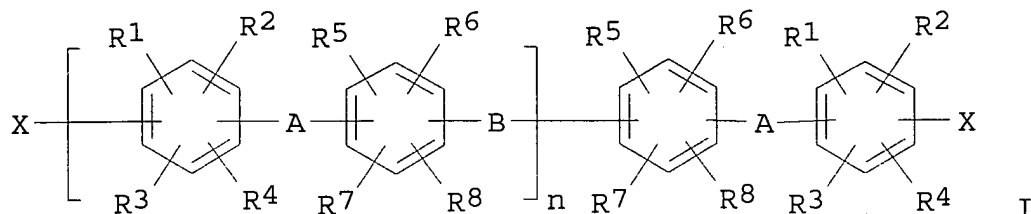


IC ICM H01M008-02  
ICS C08J005-22  
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)  
ST **fuel cell** polymer electrolyte electrode laminate  
structure manuf  
IT Polyketones  
(arom.; structure and manuf. of electrode/polymer electrolyte)

- laminates for **fuel cells**)
- IT Polyoxyalkylenes, uses  
(fluorine- and sulfo-contg., ionomers; structure and manuf. of electrode/polymer electrolyte laminates for **fuel cells**)
- IT Polyketones  
(polyether-, arom.; structure and manuf. of electrode/polymer electrolyte laminates for **fuel cells**)
- IT Polyethers, uses  
(polyketone-, arom.; structure and manuf. of electrode/polymer electrolyte laminates for **fuel cells**)
- IT Fluoropolymers, uses  
(polyoxyalkylene-, sulfo-contg., ionomers; structure and manuf. of electrode/polymer electrolyte laminates for **fuel cells**)
- IT Ionomers  
(polyoxyalkylenes, fluorine- and sulfo-contg.; structure and manuf. of electrode/polymer electrolyte laminates for **fuel cells**)
- IT **Fuel cells**  
(structure and manuf. of electrode/polymer electrolyte laminates for **fuel cells**)
- IT Carbon black, uses  
(structure and manuf. of electrode/polymer electrolyte laminates for **fuel cells**)
- IT **Fuel cell** electrolytes  
(structure of sulfonated arom. polymer electrolytes for laminating with electrodes in **fuel cells**)
- IT 7440-06-4, Platinum, uses  
(structure and manuf. of electrode/polymer electrolyte laminates for **fuel cells**)
- IT 31694-16-3D, sulfonated 41206-07-9D, sulfonated  
**478703-76-3D, sulfonated**  
(structure and manuf. of electrode/polymer electrolyte laminates for **fuel cells**)

L20 ANSWER 14 OF 22 ZCAPLUS COPYRIGHT 2003 ACS on STN  
2002:752296 Document No. 137:263436 Halogenated aromatic compound, polymer thereof, and proton-conductive **membrane** comprising same. Goto, Kohei; Takahashi, Masayuki; Yamakawa, Yoshitaka; Higami, Makoto (JSR Corporation, Japan). Eur. Pat. Appl. EP 1245555 A1 20021002, 56 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR. (English). CODEN: EPXXDW. APPLICATION: EP 2002-7018 20020327. PRIORITY: JP 2001-101586 20010330; JP 2001-230650 20010730; JP 2001-303964 20010928.

GI



AB The title halogenated arom. compds. are represented by I: wherein A independently represents an electron-withdrawing group; B independently represents an electron-donating atom or group; X represents a chlorine atom, iodine atom or bromine atom; R1 to R8 may be the same or different and each represent a hydrogen atom, fluorine atom or alkyl group; and n represents an integer of 2 or more. The polymer has a flexible structure in its main chain and thus exhibits a high toughness and good resistance to degrdn. in its mech. properties and thermal properties even when sulfonated. The polymers are useful in proton-conductive **membranes** having excellent mech. strength and durability. A polymer was prepd. by polymn. of 2,2'-bis[4-(4-chloro-benzoyl)phenoxy]diphenyl-1,1,1,3,3,3-hexafluoropropane and 2,5-dichloro-4'-(4-phenoxy)phenoxybenzophenone.

IT 463963-68-0DP, sulfonated 463963-70-4DP,  
sulfonated 463963-71-5DP, sulfonated  
463963-72-6DP, sulfonated

(halogenated arom. compd., polymer thereof, and proton-conductive **membrane** comprising same)

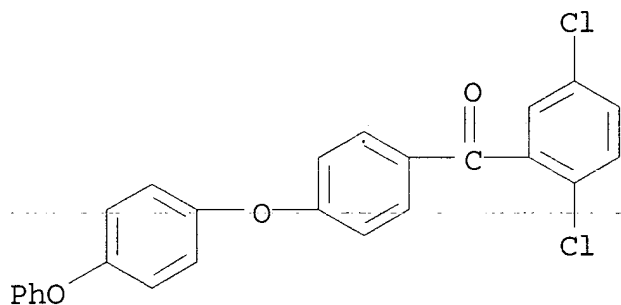
RN 463963-68-0 ZCAPLUS

CN Methanone, [[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis(4,1-phenyleneoxy-4,1-phenylene)]bis[(4-chlorophenyl)-, polymer with (2,5-dichlorophenyl)[4-(4-phenoxyphenoxy)phenyl]methanone (9CI) (CA INDEX NAME)

CM 1

CRN 463954-50-9

CMF C25 H16 Cl2 O3

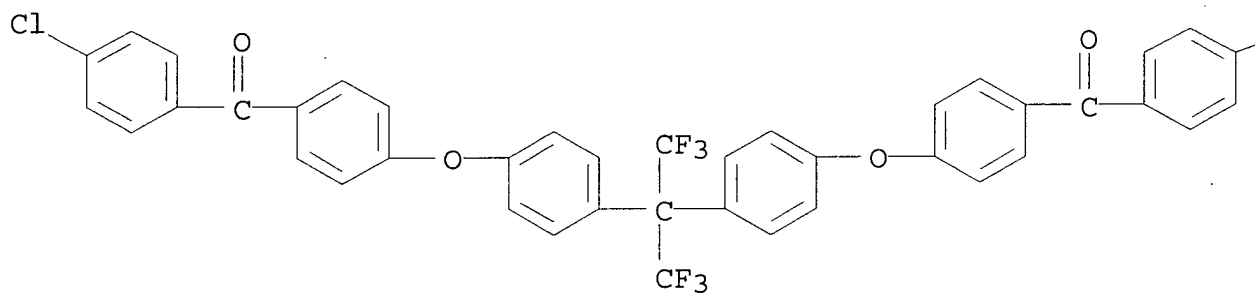


CM 2

CRN 389634-34-8

CMF C41 H24 Cl2 F6 O4

PAGE 1-A



PAGE 1-B

Cl

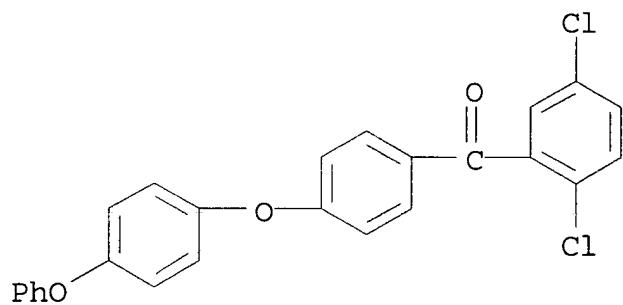
RN 463963-70-4 ZCAPLUS

CN Methanone, [[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis(4,1-phenyleneoxy-4,1-phenylene)]bis[(4-chlorophenyl)-, polymer with bis(4-chlorophenyl)methanone and (2,5-dichlorophenyl)[4-(4-phenoxyphenoxy)phenyl]methanone (9CI) (CA INDEX NAME)

CM 1

CRN 463954-50-9

CMF C25 H16 Cl2 O3

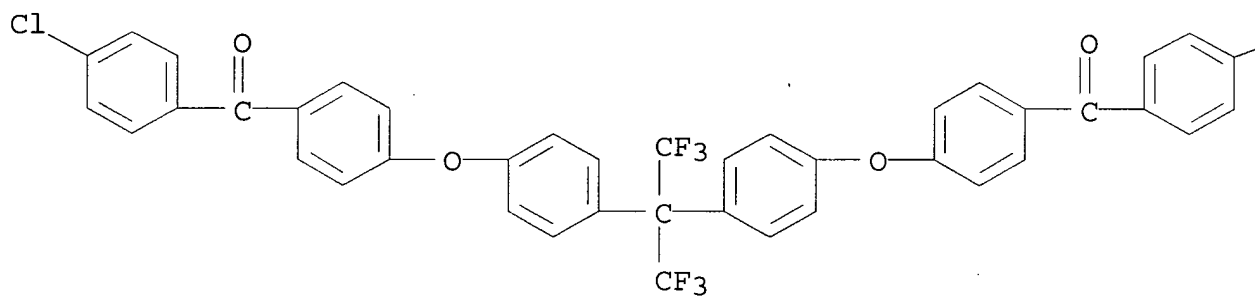


CM 2

CRN 389634-34-8

CMF C41 H24 Cl2 F6 O4

PAGE 1-A



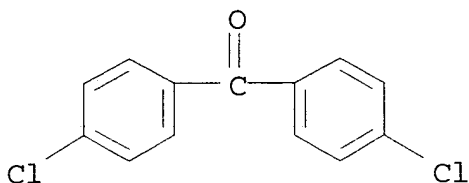
PAGE 1-B

Cl

CM 3

CRN 90-98-2

CMF C13 H8 Cl2 O



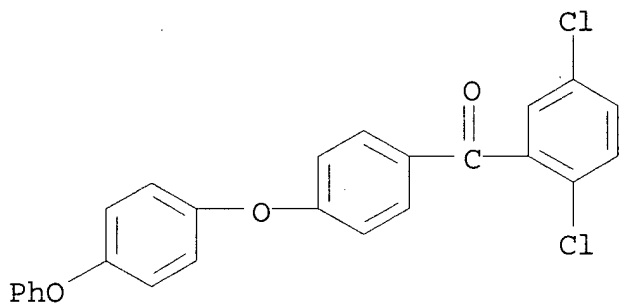
RN 463963-71-5 ZCAPLUS

CN Methanone, bis(4-chlorophenyl)-, polymer with (2,5-dichlorophenyl)[4-(4-phenoxyphenoxy)phenyl]methanone and 4,4'-[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis[phenol] (9CI) (CA INDEX NAME)

CM 1

CRN 463954-50-9

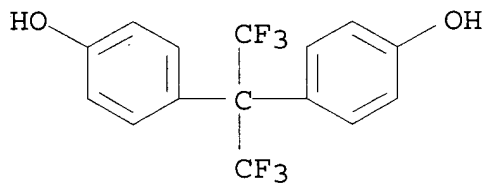
CMF C25 H16 Cl2 O3



CM 2

CRN 1478-61-1

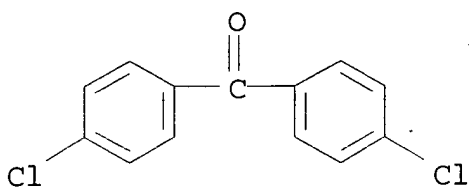
CMF C15 H10 F6 O2



CM 3

CRN 90-98-2

CMF C13 H8 Cl2 O



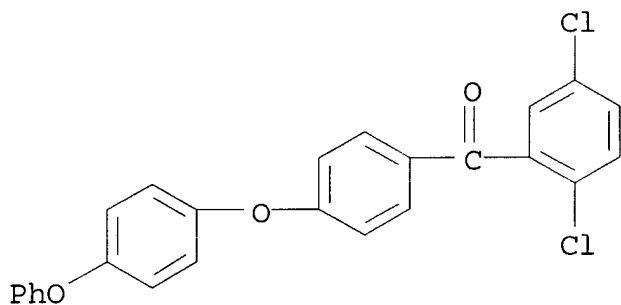
RN 463963-72-6 ZCAPLUS

CN Methanone, (2,5-dichlorophenyl) [4-(4-phenoxyphenoxy)phenyl] -,  
polymer with 1,1'-sulfonylbis[4-chlorobenzene] and  
4,4'-[2,2,2-trifluoro-1-(trifluoromethyl)ethyldiene]bis[phenol]  
(9CI) (CA INDEX NAME)

CM 1

CRN 463954-50-9

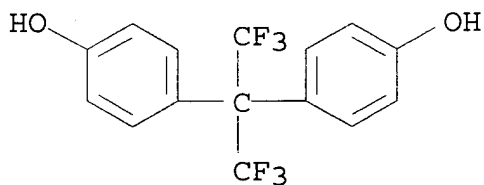
CMF C25 H16 Cl2 O3



CM 2

CRN 1478-61-1

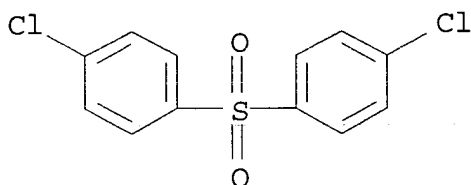
CMF C15 H10 F6 O2



CM 3

CRN 80-07-9

CMF C12 H8 Cl2 O2 S



- IC ICM C07C049-84  
 ICS C07C317-22; C08G061-12; C08G075-00; C08J005-22  
 CC 35-2 (Chemistry of Synthetic High Polymers)  
 ST halogenated polyketone polyether proton conductive **membrane**  
 IT Polyketones  
   (polyether-, arom., fluorine-contg.; halogenated arom. compd.,  
   polymer thereof, and proton-conductive **membrane**  
   comprising same)  
 IT Fluoropolymers, preparation  
   (polyether-polyketone-, arom.; halogenated arom. compd., polymer  
   thereof, and proton-conductive **membrane** comprising  
   same)  
 IT Polysulfones, preparation  
   (polyether-polyketone-; halogenated arom. compd., polymer  
   thereof, and proton-conductive **membrane** comprising  
   same)  
 IT Polyketones  
   (polyether-polysulfone-; halogenated arom. compd., polymer  
   thereof, and proton-conductive **membrane** comprising  
   same)  
 IT Polyethers, preparation  
   (polyketone-, arom., fluorine-contg.; halogenated arom. compd.,  
   polymer thereof, and proton-conductive **membrane**  
   comprising same)  
 IT Polyethers, preparation  
   (polyketone-polysulfone-; halogenated arom. compd., polymer  
   thereof, and proton-conductive **membrane** comprising  
   same)  
 IT **Membranes**, nonbiological  
   (proton-conductive; halogenated arom. compd., polymer thereof,  
   and proton-conductive **membrane** comprising same)  
 IT **463963-68-0DP, sulfonated** 463963-68-0P  
   **463963-69-1DP, sulfonated** 463963-69-1P **463963-70-4DP,**  
   **sulfonated 463963-71-5DP, sulfonated**  
   **463963-71-5P 463963-72-6DP, sulfonated**  
   **463963-72-6P**  
   (halogenated arom. compd., polymer thereof, and proton-conductive  
   **membrane** comprising same)  
 IT 123853-71-4P 389634-34-8P  
   (halogenated arom. compd., polymer thereof, and proton-conductive



- IT      **membrane** comprising same)
- IT      80-07-9, 4,4'-Dichlorodiphenylsulfone    1478-61-1, Bisphenol AF  
2069-48-9, 4-Chloro-4'-fluorobenzophenone  
(halogenated arom. compd., polymer thereof, and proton-conductive  
**membrane** comprising same)
- IT      90884-65-4P  
(oligomeric; halogenated arom. compd., polymer thereof, and  
proton-conductive **membrane** comprising same)
- IT      122325-09-1P  
(oligomeric; halogenated arom. compd., polymer thereof, and  
proton-conductive **membrane** comprising same)

L20    ANSWER 15 OF 22    ZCAPLUS    COPYRIGHT 2003 ACS on STN  
2001:729786    Document No. 135:273390    Polyarylene copolymers and  
proton-conductive **membrane**.    Goto, Kohei; Yamakawa,  
Yoshitaka; Kakuta, Mayumi; Rozhanskii, Igor (Jsr Corp., Japan).  
Eur. Pat. Appl. EP 1138712 A2 20011004, 31 pp.    DESIGNATED STATES:  
R:    AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT,  
IE, SI, LT, LV, FI, RO.    (English).    CODEN: EPXXDW.    APPLICATION: EP  
2001-107586 20010327.    PRIORITY: JP 2000-91259 20000329; JP  
2000-153047 20000524.

AB      A polyarylene copolymer comprises (A) 60-3 mol% arom. compd. units  
having a main chain contg. one or more electron-withdrawing groups  
therein and (B) 40-97 mol% arom. compd. units having a main chain  
contg. no electron-withdrawing groups therein. A proton-conductive  
**membrane** comprises the polyarylene copolymer having sulfonic  
acid groups. 3,4'-Bis(4-chlorobenzoylamino)diphenyl ether and  
2,5-dichloro-4'-phenoxybenzophenone were copolymd. and sulfonated to  
give a conductive **membrane**.

IT      **364062-41-9DP, sulfonated**  
(polyarylene copolymers and proton-conductive **membrane**)

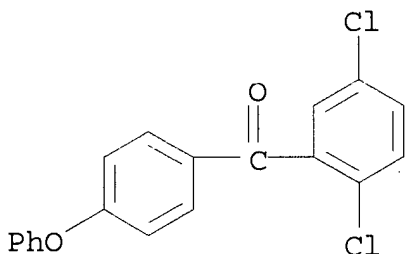
RN      364062-41-9    ZCAPLUS

CN      Methanesulfonic acid, trifluoro-, [2,2,2-trifluoro-1-  
(trifluoromethyl)ethylidene]di-4,1-phenylene ester, polymer with  
(2,5-dichlorophenyl)(4-phenoxyphenyl)methanone (9CI)    (CA INDEX  
NAME)

CM      1

CRN    151173-25-0

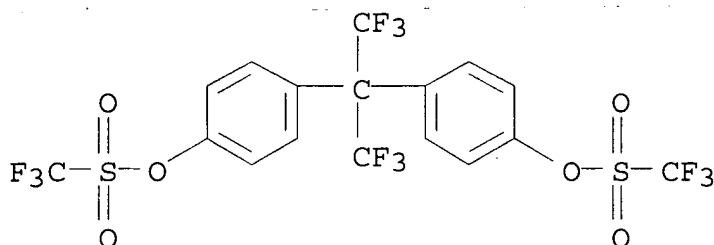
CMF    C19 H12 Cl2 O2



CM 2

CRN 83558-77-4

CMF C17 H8 F12 O6 S2



- IC ICM C08G061-12
- CC 35-5 (Chemistry of Synthetic High Polymers)  
Section cross-reference(s): 76
- ST polyoxyarylene sulfonated proton conductor **membrane**
- IT Polyoxyarylenes  
(polyarylene copolymers and proton-conductive **membrane**)
- IT Polyketones  
(polyether-, arom., fluorine-contg.; polyarylene copolymers and proton-conductive **membrane**)
- IT Polyketones  
(polyether-, arom.; polyarylene copolymers and proton-conductive **membrane**)
- IT Fluoropolymers, preparation  
(polyether-polyketone-, arom.; polyarylene copolymers and proton-conductive **membrane**)
- IT Polyethers, preparation  
(polyketone-, arom., fluorine-contg.; polyarylene copolymers and proton-conductive **membrane**)
- IT Polyethers, preparation  
(polyketone-, arom.; polyarylene copolymers and proton-conductive **membrane**)
- IT **Membranes**, nonbiological  
(proton-conductive; polyarylene copolymers and proton-conductive **membrane**)
- IT Ionic conductors  
(protonic; polyarylene copolymers and proton-conductive **membrane**)
- IT 364062-38-4DP, sulfonated 364062-39-5DP, sulfonated  
364062-40-8DP, sulfonated **364062-41-9DP, sulfonated**  
(polyarylene copolymers and proton-conductive **membrane**)
- IT 63175-37-1P, 4,4'-Bis(4-chlorobenzoyl)diphenyl Ether  
(polyarylene copolymers and proton-conductive **membrane**)
- IT 101-84-8, Diphenyl ether 122-01-0, 4-Chlorobenzoyl chloride



polyether-polyketones)

L20 ANSWER 17 OF 22 ZCAPLUS COPYRIGHT 2003 ACS on STN  
 2000:623546 Document No. 133:223864 Sulfonated aromatic polymers,  
**membranes** containing these polymers, procedures for their  
 production and their as proton conductors for **fuel**  
**cells**. Dyck, Alexander; Guth, Thomas (Aventis Research &  
 Technologies G.m.b.H. & Co. K.-G., Germany). Ger. Offen. DE  
 19909028 A1 20000907, 10 pp. (German). CODEN: GWXXBX.  
 APPLICATION: DE 1999-19909028, 19990302.

AB Sulfonated polymers contg. repeating units  
 $\text{OAr}_1(\text{SO}_3\text{R})_n\text{C}(\text{CF}_3)_2\text{Ar}_1(\text{SO}_3\text{R})_n\text{OAr}_2(\text{XAr}_2)_m$  [ $\text{Ar}_1$ ,  $\text{Ar}_2$  = (substituted)  
 bivalent arom. or heteroarom. groups,  $\text{R}$  = H, alkali metal, alk.  
 earth metal, or  $\text{NH}_4$ ,  $n$  = 0-3  $m$  = 0-2,  $\text{X}$  = CO, O,  $\text{CpH}_2\text{p}$ ,  $\text{CpF}_2\text{p}$ , or S,  
 $p$  = 1-10] give **membranes** with high proton cond. for use in  
 gas **fuel cells**.

IT **69254-20-2DP**, 4,4'-Difluorobenzophenone-4,4'-  
 hexafluoroisopropylidenediphenol copolymer, **sulfonated**  
**69266-28-0DP**, **sulfonated**

(**sulfonated** arom. polymers, **membranes** contg.  
 these polymers, procedures for their prodn. and their as proton  
 conductors for **fuel cells**)

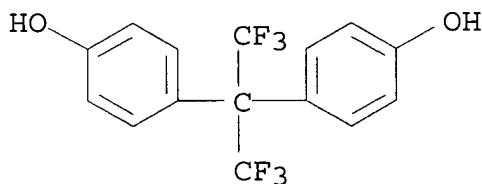
RN 69254-20-2 ZCAPLUS

CN Methanone, bis(4-fluorophenyl)-, polymer with 4,4'-[2,2,2-trifluoro-  
 1-(trifluoromethyl)ethylidene]bis[phenol] (9CI) (CA INDEX NAME)

CM 1

CRN 1478-61-1

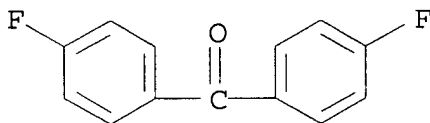
CMF C15 H10 F6 O2



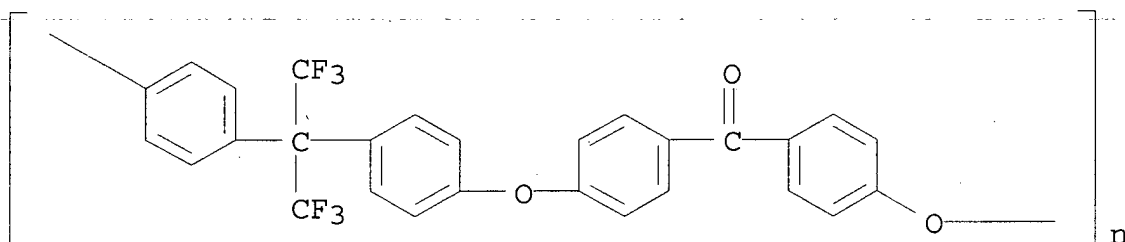
CM 2

CRN 345-92-6

CMF C13 H8 F2 O



RN 69266-28-0 ZCAPLUS  
 CN Poly[oxy-1,4-phenylene[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]-1,4-phenyleneoxy-1,4-phenylenecarbonyl-1,4-phenylene] (9CI) (CA INDEX NAME)



IC ICM C08L081-00  
 ICS C08L039-00; C08G065-48; C08J005-18; H01M008-02; C25B013-08; H01G004-18

CC 38-3 (Plastics Fabrication and Uses)  
 Section cross-reference(s): 52

ST sulfonated fluorinated arom polyether proton conductor gas  
**fuel cell; membrane** sulfonated  
 fluorinated arom polyether proton conductor

IT **Fuel cells**  
 (gas; sulfonated arom. polymers, **membranes** contg. these  
 polymers, procedures for their prodn. and their as proton  
 conductors for **fuel cells**)

IT Polyketones  
 Polyketones  
 Polyketones  
 (polyether-, fluorine-contg.; sulfonated arom. polymers,  
**membranes** contg. these polymers, procedures for their  
 prodn. and their as proton conductors for **fuel**  
**cells**)

IT Fluoropolymers, uses  
 (polyether-polyketone-; sulfonated arom. polymers,  
**membranes** contg. these polymers, procedures for their  
 prodn. and their as proton conductors for **fuel**  
**cells**)

IT Polyethers, uses  
 Polyethers, uses  
 Polyethers, uses  
 (polyketone-, fluorine-contg.; sulfonated arom. polymers,  
**membranes** contg. these polymers, procedures for their  
 prodn. and their as proton conductors for **fuel**  
**cells**)

IT Ionic conductors  
 (proton; sulfonated arom. polymers, **membranes** contg.  
 these polymers, procedures for their prodn. and their as proton  
 conductors for **fuel cells**)

IT 69254-20-2DP, 4,4'-Difluorobenzophenone-4,4'-  
hexafluoroisopropylidenediphenol copolymer, **sulfonated**  
69266-28-0DP, **sulfonated**  
(**sulfonated** arom. polymers, **membranes** contg.  
these polymers, procedures for their prodn. and their as proton  
conductors for **fuel cells**)

L20 ANSWER 18 OF 22 ZCAPLUS COPYRIGHT 2003 ACS on STN  
1999:166547 Document No. 130:224121 Composite solid polymer  
electrolyte **membranes** and casting or extrusion of a  
composite **membrane**. Formato, Richard M.; Kovar, Robert  
F.; Osenar, Paul; Landrau, Nelson (Foster-Miller, Inc., USA). PCT  
Int. Appl. WO 9910165 A1 19990304, 70 pp. DESIGNATED STATES: W:  
AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK,  
EE, ES, FI, GB, GE, GH, GM, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ,  
LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT,  
RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN,  
YU, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF,  
CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC,  
ML, MR, NE, NL, PT, SE, SN, TD, TG. (English). CODEN: PIXXD2.  
APPLICATION: WO 1998-US17898 19980828. PRIORITY: US 1997-57233  
19970829.

AB Composite solid polymer electrolyte **membranes** (SPEMs)  
include a porous polymer substrate interpenetrated with an  
ion-conducting material. The SPEMs are useful in electrochem.  
applications, including **fuel cells**, electrode  
separators, and electrodialysis. Thus, polybenzoxazole substrate  
film (solvent exchanged into NMP) was added to 5% soln. contg.  
sulfonated (75%) Radel R (I) and after 12 h placed into 20% soln. of  
sulfonated I, and the composite film isolated, stretched, dried, and  
solvent extd. to give a film having resistance 0.056 .OMEGA.-cm<sup>2</sup>;  
vs. 0.203 for a Nafion 117 control film.

IT 220998-11-8DP, **sulfonated**

(in composite solid polymer electrolyte **membranes**)

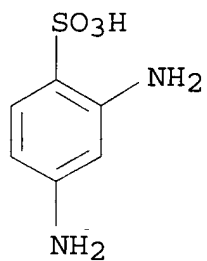
RN 220998-11-8 ZCAPLUS

CN Benzenesulfonic acid, 2,4-diamino-, monosodium salt, polymer with  
1,3-benzenediamine and 5,5'-[2,2,2-trifluoro-1-  
(trifluoromethyl)ethylidene]bis[1,3-isobenzofurandione] (9CI) (CA  
INDEX NAME)

CM 1

CRN 3177-22-8

CMF C6 H8 N2 O3 S . Na

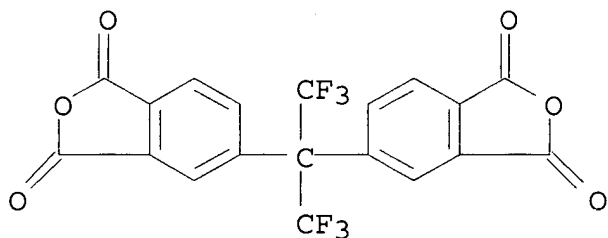


Na

CM 2

CRN 1107-00-2

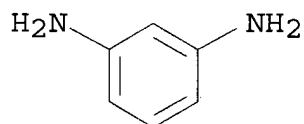
CMF C19 H6 F6 O6



CM 3

CRN 108-45-2

CMF C6 H8 N2



IC ICM B32B003-26  
 ICS B01D021-28; B01D024-00; B05D005-00; H01M008-10  
 CC 38-3 (Plastics Fabrication and Uses)  
 Section cross-reference(s): 52, 66, 72  
 ST ion conducting material composite electrolyte **membrane**;  
 porous polybenzoxazole film composite electrolyte **membrane**

- ; **fuel cell** composite electrolyte
- membrane**; electrodialysis composite electrolyte
- membrane**; sulfonated polyether sulfone composite electrolyte
- membrane**
- IT Polyamides, uses
- Polyketones
  - (arom.; in composite solid polymer electrolyte **membranes**)
- IT Heat-resistant materials
  - Membranes**, nonbiological
    - (blend of porous polymer substrate and ion conducting material; composite solid polymer electrolyte **membranes** with low resistance, good strength and heat resistance)
- IT Polymer blends
  - (blend of porous polymer substrate and ion conducting material; composite solid polymer electrolyte **membranes** with low resistance, good strength and heat resistance)
- IT **Fuel cells**
  - (composite solid polymer electrolyte **membranes** with low resistance, good strength and heat resistance)
- IT Primary batteries
  - (electrode separators; composite solid polymer electrolyte **membranes** with low resistance, good strength and heat resistance)
- IT **Dialyzers**
  - (electrodialyzers; composite solid polymer electrolyte **membranes** with low resistance, good strength and heat resistance)
- IT Liquid crystals, polymeric
  - (in composite solid polymer electrolyte **membranes**)
- IT Polybenzimidazoles
- Polybenzothiazoles
- Polybenzoxazoles
- Polyimides, uses
- Polyoxyphenylenes
- Polysulfones, uses
- Polythiophenylenes
  - (in composite solid polymer electrolyte **membranes**)
- IT Polysulfones, uses
- Polysulfones, uses
  - (polyether-, arom.; in composite solid polymer electrolyte **membranes**)
- IT Polyimides, uses
- Polyimides, uses
- Polyketones
- Polyketones
- Polysulfones, uses
- Polysulfones, uses
  - (polyether-; in composite solid polymer electrolyte **membranes**)
- IT Polyethers, uses
- Polyethers, uses



- (polyimide-; in composite solid polymer electrolyte **membranes**)
- IT Polyethers, uses  
Polyethers, uses  
(polyketone-; in composite solid polymer electrolyte **membranes**)
- IT Polyquinoxalines  
(polyphenylquinoxalines; in composite solid polymer electrolyte **membranes**)
- IT Polyethers, uses  
Polyethers, uses  
(polysulfone-, arom.; in composite solid polymer electrolyte **membranes**)
- IT Polyethers, uses  
Polyethers, uses  
(polysulfone-; in composite solid polymer electrolyte **membranes**)
- IT 220998-11-8P, 6FDA-1,3-phenylenediamine-sodium 2,4-diaminobenzenesulfonate copolymer  
(imidized, sulfonated; in composite solid polymer electrolyte **membranes**)
- IT 25135-51-7DP, Udel, sulfonated 25667-42-9DP, Ultrason E, sulfonated 27380-27-4DP, Victrex pek, sulfonated 154281-38-6DP, Radel R, sulfonated, sodium salts  
(in composite solid polymer electrolyte **membranes**)
- IT **220998-11-8DP, sulfonated**  
(in composite solid polymer electrolyte **membranes**)
- IT 24938-64-5, p-Phenylenediamine-terephthalic acid copolymer, sru  
25035-37-4, p-Phenylenediamine-terephthalic acid copolymer  
25190-62-9, Poly(1,4-phenylene) 27028-97-3, Polyphenylene sulfide sulfone 31694-16-3, PEEK 63496-24-2, Nafion ew 1100  
(in composite solid polymer electrolyte **membranes**)
- L20 ANSWER 19 OF 22 ZCAPLUS COPYRIGHT 2003 ACS on STN  
1997:595993 Document No. 127:296038 Development of solid electrolytes for water electrolysis at higher temperature. Linkous, Clovis A. (Florida Solar Energy Center, Cocoa, FL, 32922-5703, USA). Proceedings of the U.S. DOE Hydrogen Program Review, Miami, May 1-2, 1996, Volume 1, 443-448. National Renewable Energy Laboratory: Golden, Colo. (English) 1996. CODEN: 65ABAC.
- AB This report describes our efforts in developing new solid polymer electrolytes that will enable operation of proton exchange **membrane** electrolyzers at higher temps. than are currently possible. Several ionomers have been prepd. from polyetheretherketone (PEEK), polyethersulfone (PES), and polyphenylquinoxaline (PPQ) by employing various sulfonation procedures. By controlling the extent of sulfonation, a range of proton conductivities could be achieved, whose upper limit actually exceeded that of com. available perfluoralkyl sulfonates. Thermoconductimetric anal. of samples at various degrees of sulfonation showed an inverse relationship between cond. and max. operating temp. This was attributed to the dual effect of adding

sulfonate groups to the polymer: more acid groups produce more protons for increased cond., but they also increase water uptake, which mech. weakens the **membrane**. This situation was exacerbated by the limited acidity of the arom. sulfonic acids (pK<sub>a</sub> .apprx. 2-3). The possibility of using partial fluorination to raise the acid dissocn. const. is discussed.

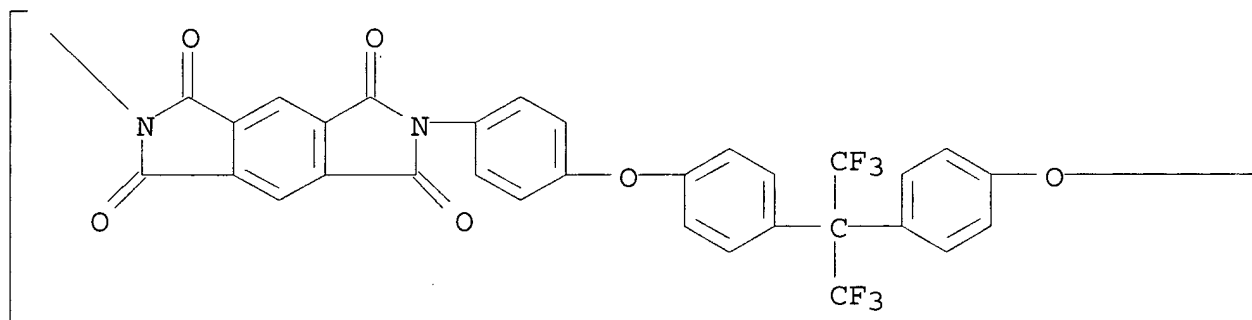
IT 84769-07-3D, **sulfonated**

(**sulfonated** solid polymer electrolytes for water electrolysis at higher temp.)

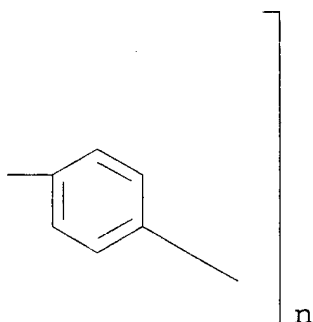
RN 84769-07-3 ZCAPLUS

CN Poly[(5,7-dihydro-1,3,5,7-tetraoxobenz[1,2-c:4,5-c']dipyrrole-2,6(1H,3H)-diyl)-1,4-phenyleneoxy-1,4-phenylene[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]-1,4-phenyleneoxy-1,4-phenylene] (9CI)  
(CA INDEX NAME)

PAGE 1-A



PAGE 1-B



CC 52-1 (Electrochemical, Radiational, and Thermal Energy Technology)  
Section cross-reference(s): 38, 72

IT 25667-42-9D, **sulfonated** 25734-65-0D, **sulfonated** 31694-16-3D,  
Peek, **sulfonated** 51109-40-1D, **sulfonated** 84769-07-3D,  
**sulfonated**

(**sulfonated** solid polymer electrolytes for water electrolysis at higher temp.)

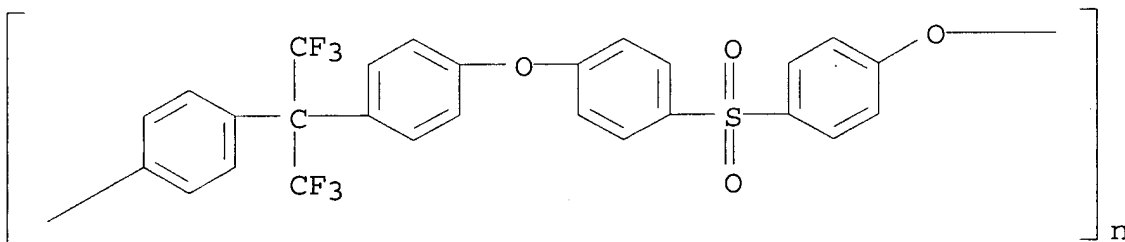
L20 ANSWER 20 OF 22 ZCAPLUS COPYRIGHT 2003 ACS on STN  
 1995:227358 Document No. 122:59037 Multilayer gas separation  
**membranes** prepared by one-step coating process **Bikson,**  
 Benjamin; Nelson, Joyce K. (Praxair Technology, Inc., USA). U.S. US  
 5356459 A 19941018, 9 pp. (English). CODEN: USXXAM. APPLICATION:  
 US 1993-83604 19930630.

AB The **membranes** have an interior gas sepn. layer and an  
 external defect sealing layer. The process for **membrane**  
 prodn. comprises (a) applying a thin layer of a coating soln. to a  
 substrate, contg. .ltoreq.5 wt./vol.% polymeric gas or vapor sepn.  
**membrane** forming material (sulfonated polysulfone or  
 polyoxyphenylene) in a solvent system, and .ltoreq.20 wt.%, based on  
 the wt. of the **membrane** forming material, of a  
 polysiloxane; and (b) drying the thin coating layer on the  
 substrate, forming a multilayer composite **membrane** having  
 an interior sepn. layer of the polymeric **membrane** forming  
 material, that detcs. the gas or vapor sepn. characteristics of the  
**membrane** deposited on the substrate and an exterior  
 protective layer of polysiloxane over the sepn. layer.

IT **31694-07-2DP, sulfonated, lithiated, polymers with**  
**GP-4 amine functional silicone**  
 (multilayer gas sepn. **membranes** prepd. by one-step  
 coating process)

RN 31694-07-2 ZCAPLUS

CN Poly[oxy-1,4-phenylenesulfonyl-1,4-phenyleneoxy-1,4-phenylene [2,2,2-  
 trifluoro-1-(trifluoromethyl)ethylidene]-1,4-phenylene] (9CI) (CA  
 INDEX NAME)



IC ICM B01D053-22

ICS B01D069-08; B01D071-70

NCL 095054000

CC 47-2 (Apparatus and Plant Equipment)

Section cross-reference(s): 38, 49

ST gas sepn **membrane** multilayer; polysulfone sulfonated gas  
 sepn **membrane**; polyoxyphenylene sulfonated gas sepn  
**membrane**

IT Siloxanes and Silicones, uses

(Perenol S-4; multilayer gas sepn. **membranes** prepd. by  
 one-step coating process)

IT **Membranes**

- (multilayer gas sepn. **membranes** prepd. by one-step coating process)
- IT Air  
(multilayer gas sepn. **membranes** prepd. by one-step coating process)
- IT Siloxanes and Silicones, uses  
(3-aminopropyl Me, di-Me, GP-4 amine functional silicone fluid; multilayer gas sepn. **membranes** prepd. by one-step coating process)
- IT Polysulfones, uses  
(bisphenol A-based, hexafluoro, sulfonated, lithiated, F6 SPS-Li, siloxanes-; multilayer gas sepn. **membranes** prepd. by one-step coating process)
- IT Polysulfones, uses  
(fiber, multilayer gas sepn. **membranes** prepd. by one-step coating process)
- IT **Membranes**  
(hollow-fiber, multilayer gas sepn. **membranes** prepd. by one-step coating process)
- IT Synthetic fibers, polymeric  
(polysulfones, multilayer gas sepn. **membranes** prepd. by one-step coating process)
- IT Polyoxyphenylenes  
Polysulfones, uses  
(sulfonated, siloxanes-; multilayer gas sepn. **membranes** prepd. by one-step coating process)
- IT 1333-74-0P, Hydrogen, preparation 7727-37-9P, Nitrogen, preparation 7782-44-7P, Oxygen, preparation  
(multilayer gas sepn. **membranes** prepd. by one-step coating process)
- IT 31694-07-2DP, **sulfonated**, lithiated, polymers with GP-4 amine functional silicone  
(multilayer gas sepn. **membranes** prepd. by one-step coating process)

L20 ANSWER 21 OF 22 ZCAPLUS COPYRIGHT 2003 ACS on STN  
1993:62056 Document No. 118:62056 Reactive treatment of composite gas separation **membranes** for solvent resistance and decreased surface tension. Bikson, Benjamin; Nelson, Joyce K. (Union Carbide Industrial Gases Technology Corp., USA). U.S. US 5131927 A 19920721, 8 pp. (English). CODEN: USXXAM. APPLICATION: US 1991-688327 19910422.

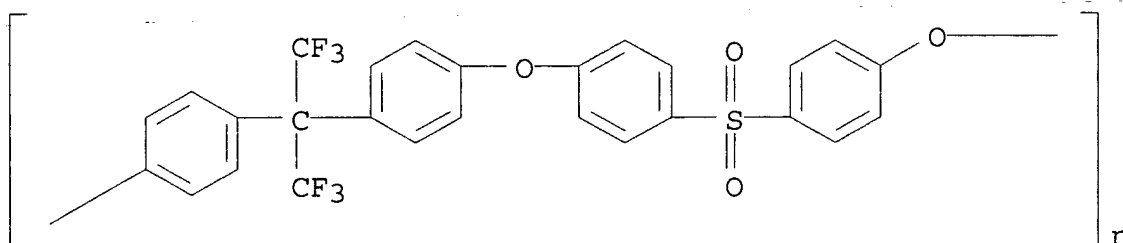
AB A composite hollow-fiber gas-sepn. **membrane** comprising a porous polysulfone substrate and a sulfonated polysulfone gas-sepn. layer is treated with a post-treating agent through direct ionic bonding. The agent is a fluorocarbon contg. aminofunctional groups or an aminofunctional siloxane contg. perfluorohydrocarbon groups, and has a surface tension .ltorsim.40 dynes/cm at 20.degree., which is lower than that of the gas sepn. layer. The treated composite **membrane** is resistant to solvents and has decreased surface energy.

IT 31694-07-2D, **sulfonated**

(gas-sepn. layer, in composite **membrane**, for solvent resistance)

RN 31694-07-2 ZCAPLUS

CN Poly[oxy-1,4-phenylenesulfonyl-1,4-phenyleneoxy-1,4-phenylene[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]-1,4-phenylene] (9CI) (CA INDEX NAME)



IC ICM B01D053-22

ICS B01D071-68

NCL 055016000

CC 47-2 (Apparatus and Plant Equipment)

ST hollow fiber composite sepn **membrane**; polysulfone composite gas sepn **membrane**; solvent resistant composite sepn **membrane**

IT Polysulfones, uses

(**membranes**, composite, surface-treated, for solvent resistance in gas sepn.)

IT Siloxanes and Silicones, uses

(amino, contg. perfluorohydrocarbon groups, composite gas-sepn. **membranes** treatment with, for solvent resistance)

IT **Membranes**

(composite, hollow-fiber, polysulfone, surface treatment of, for solvent resistance)

IT Siloxanes and Silicones, uses

(di-Me, gas-sepn. layer treatment with, in composite **membranes** for solvent resistance)

IT Hydrocarbons, uses

(fluoro, contg. aminofunctional groups, composite gas-sepn. **membranes** treatment with, for solvent resistance)

IT Polyoxyphenylenes

(sulfonated, gas-sepn. layer in composite **membranes**, with solvent resistance)

IT 3663-42-1

(gas-sepn. layer treatment with, in composite **membranes** for solvent resistance)

IT 31694-07-2D, sulfonated

(gas-sepn. layer, in composite **membrane**, for solvent resistance)

L20 ANSWER 22 OF 22 ZCAPLUS COPYRIGHT 2003 ACS on STN

1991:124183 Document No. 114:124183 Sulfonated hexafluorobisphenol A

polysulfone **membranes** for gas separations. Kawakami, James H.; Bikson, Benjamin; Gotz, Gertrud; Ozcayir, Yurdagul (Union Carbide Industrial Gases Technology Corp., USA). U.S. US 4971695 A 19901120, 7 pp. (English). CODEN: USXXAM. APPLICATION: US 1989-429614 19891031.

AB **Membranes** with good permeability for the title use comprise a sulfonated polymer having hexafluorobisphenol A- and di-Ph sulfone-based repeating units. A **membrane**, prepd. by casting sulfonated 4,4'-[2,2,2-trifluoro(trifluoromethyl)ethylidene]bisphenol-4,4'-dichlorodiphenyl sulfone copolymer (I) in DMF soln. and drying at 70.degree. for a wk, had permeability coeffs. 19.8 (He), 0.9 (O), and 0.13 (N), vs. 4.8, 0.15, and 0.022, resp., for sulfonated Udel 3500 instead of sulfonated I.

IT **90884-65-4DP, sulfonated**  
(manuf. of, for gas selective **membranes**)

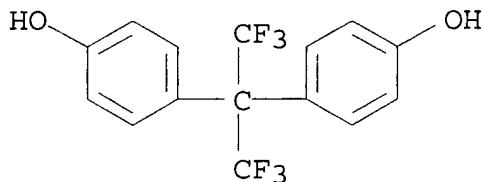
RN 90884-65-4 ZCAPLUS

CN Phenol, 4,4'-[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis-, polymer with 1,1'-sulfonylbis[4-chlorobenzene] (9CI) (CA INDEX NAME)

CM 1

CRN 1478-61-1

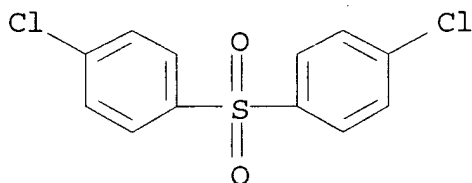
CMF C15 H10 F6 O2



CM 2

CRN 80-07-9

CMF C12 H8 Cl2 O2 S



IC ICM B01D013-00

NCL 210500230

CC 38-3 (Plastics Fabrication and Uses)

- Section cross-reference(s): 37, 48
- ST fluorobisphenol A polysulfone permselective **membrane**;  
chlorodiphenyl sulfone polyether permselective **membrane**;  
polyether polysulfone gas selective **membrane**; sulfonated  
polyether polysulfone permselective **membrane**
- IT **Membranes**  
(permselective, sulfonated hexafluorobisphenol A-based  
polyether-polysulfones, for gas sepn.)
- IT Polysulfones, compounds  
(polyether-, arom., fluorine-contg., sulfonated,  
**membranes**, permselective, for gas sepn.)
- IT Fluoropolymers  
(polyether-polysulfone-, arom., sulfonated, **membranes**,  
permselective, for gas sepn.)
- IT Polyethers, compounds  
(polysulfone-, arom., fluorine-contg., sulfonated,  
**membranes**, permselective, for gas sepn.)
- IT 7440-48-4DP, Cobalt, salts with sulfonated hexafluorobisphenol  
A-based polyether-polysulfones 7664-41-7DP, Ammonia, salts with  
sulfonated hexafluorobisphenol A-based polyether-polysulfones  
31694-07-2P **90884-65-4DP, sulfonated**  
(manuf. of, for gas selective **membranes**)
- IT 7440-59-7, Helium, properties 7727-37-9, Nitrogen, properties  
7782-44-7, Oxygen, properties  
(permeability of, through sulfonated hexafluorobisphenol A-based  
polyether-polysulfone **membranes**)

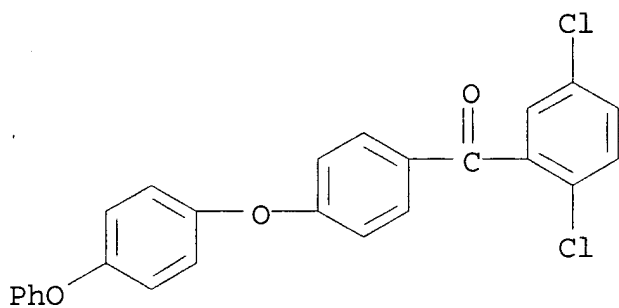
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- L21 ANSWER 1 OF 6 ZCAPLUS COPYRIGHT 2003 ACS on STN  
2003:734875 Method for recovering sulfonic acid group-containing  
polymers after sulfonation. Ogami, Koichi (JSR Ltd., Japan). Jpn.  
Kokai Tokkyo Koho JP 2003261684 A2 20030919, 10 pp. (Japanese).  
CODEN: JKXXAF. APPLICATION: JP 2002-61035 20020306.
- AB The method contains sulfonating polymers of 1/5- to 1/60-fold wt. of  
H2SO4 in 95.5-99.5% H2SO4, adjusting the wt. ratio of H2SO4/H2O to  
94/6-85/15, and coagulating the sulfonated polymers. Thus, 25 g a  
polyarylene copolymer (Mw 14,5000) prepd. from 28.4 g bisphenol  
AF-4,4'-dichlorobenzophenone oligomer and 29.2 g  
2,5-dichloro-4'-(4-phenoxy)phenoxybenzophenone was stirred with 250  
mL 94.5% H2SO4, dild. with 150 mL 88% H2SO4, pptd. with H2O, and  
washed to give a polymer with Mw 276,000.
- IT **463963-71-5DP**, Bisphenol AF-4,4'-dichlorobenzophenone-2,5-  
dichloro-4'-(4-phenoxy)phenoxybenzophenone copolymer,  
**sulfonated**  
(recovery of **sulfonated** polyarylene copolymers after  
dilg. reaction solns. for viscosity redn.)
- RN 463963-71-5 ZCAPLUS
- CN Methanone, bis(4-chlorophenyl)-, polymer with (2,5-dichlorophenyl)[4-  
(4-phenoxyphenoxy)phenyl]methanone and 4,4'-[2,2,2-trifluoro-1-  
(trifluoromethyl)ethylidene]bis[phenol] (9CI) (CA INDEX NAME)

CM 1

CRN 463954-50-9

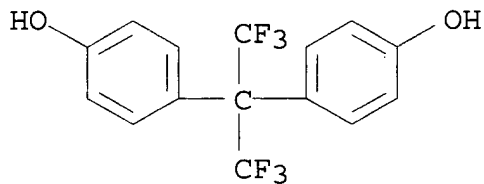
CMF C25 H16 Cl2 O3



CM 2

CRN 1478-61-1

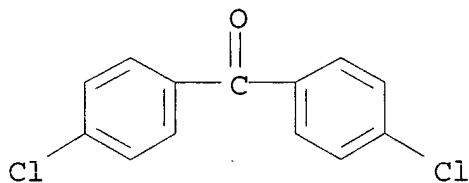
CMF C15 H10 F6 O2



CM 3

CRN 90-98-2

CMF C13 H8 Cl2 O



IC ICM C08G085-00

ICS C08G065-48

CC 35-8 (Chemistry of Synthetic High Polymers)

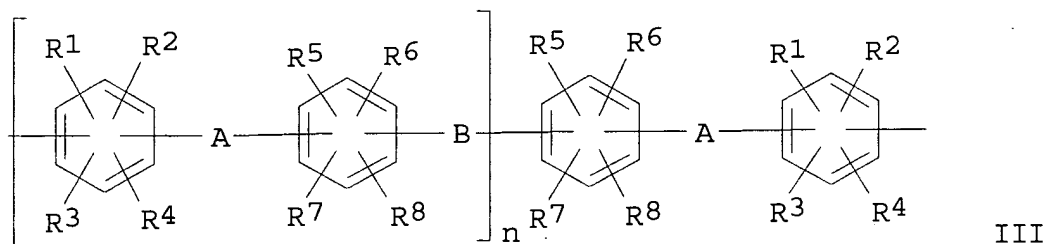
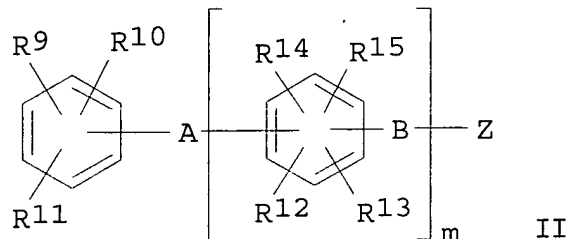
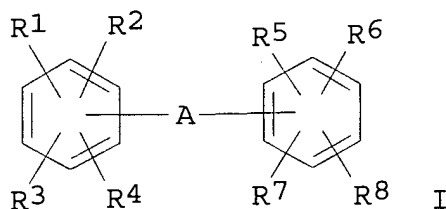


IT **463963-71-5DP**, Bisphenol AF-4,4'-dichlorobenzophenone-2,5-dichloro-4'-(4-phenoxy)phenoxybenzophenone copolymer, **sulfonated**

(recovery of **sulfonated** polyarylene copolymers after dilg. reaction solns. for viscosity redn.)

L21 ANSWER 2 OF 6 ZCAPLUS COPYRIGHT 2003 ACS on STN  
 2003:582513 Document No. 139:158287 Polyarylene-based copolymers, their sulfonated polymers, and their proton-conducting films. Yamakawa, Yoshitaka; Kadota, Mayumi; Takahashi, Masayuki; Goto, Kohei (JSR Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2003212988 A2 20030730, 13 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2002-10745 20020118.

GI



AB The polyarylene-based copolymers have structure units I (A = electron-withdrawing group; R1-R8 = H, F, alkyl, fluoroalkyl), II (A = same as in I; B = electron-donating atom or divalent group; R9-R15 = H, F, alkyl, fluoroalkyl; Z = aryl; m = 1, 2), and III (A, B, R1-R8 = same as in I and II; n .gtoreq.2 integer). The bend structure in the main chain provides high toughness and suppresses excess sulfonation, hence the toughness and hot water resistance

will not be degraded. The proton-conducting films of the sulfonated copolymers have good toughness, durability, oxidn. resistance, heat resistance, and proton cond.

IT 463963-71-5DP, Bisphenol AF-4,4'-dichlorobenzophenone-2,5-dichloro-4'-(4-phenoxy)phenoxybenzophenone copolymer, **sulfonated**

(polyarylene-based copolymers and their **sulfonated** polymers for proton-conducting films showing good toughness, durability, oxidn. and heat resistances, and proton cond.)

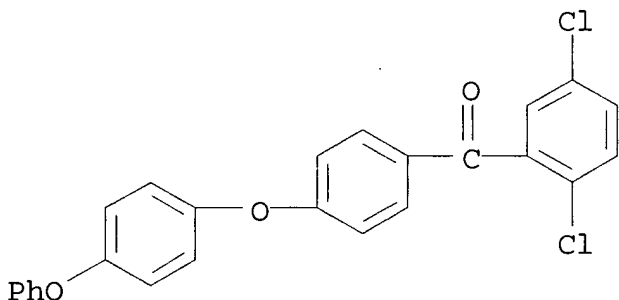
RN 463963-71-5 ZCAPLUS

CN Methanone, bis(4-chlorophenyl)-, polymer with (2,5-dichlorophenyl)[4-(4-phenoxyphenoxy)phenyl]methanone and 4,4'-[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis[phenol] (9CI) (CA INDEX NAME)

CM 1

CRN 463954-50-9

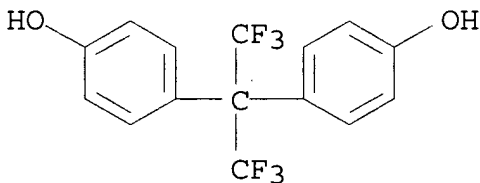
CMF C25 H16 Cl2 O3



CM 2

CRN 1478-61-1

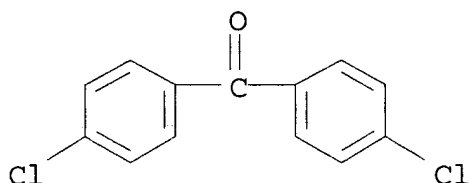
CMF C15 H10 F6 O2



CM 3

CRN 90-98-2

CMF C13 H8 Cl2 O

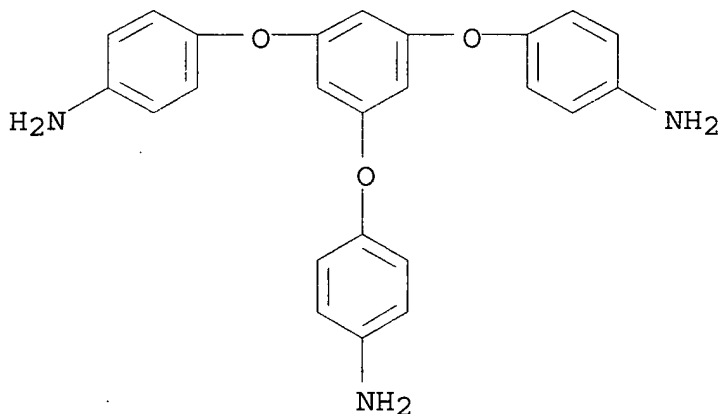


- IC ICM C08G065-00  
ICS C08J005-22; H01B001-06; H01M008-02; H01M008-10; H01M006-18;  
H01M010-40; C08L071-10
- CC 76-2 (Electric Phenomena)  
Section cross-reference(s): 37, 38
- IT **463963-71-5DP**, Bisphenol AF-4,4'-dichlorobenzophenone-2,5-dichloro-4'-(4-phenoxy)phenoxybenzophenone copolymer, **sulfonated**  
(polyarylene-based copolymers and their **sulfonated** polymers for proton-conducting films showing good toughness, durability, oxidn. and heat resistances, and proton cond.)
- L21 ANSWER 3 OF 6 ZCAPLUS COPYRIGHT 2003 ACS on STN  
2003:281054 Document No. 139:36904 Synthesis of arenesulfonated hyperbranched polyimide from A2 + B3 monomers. Chen, Huan; Yin, Jie; Xu, Hongjie (Research Institute of Polymer Materials, School of Chemistry and Chemical Technology, State Key Laboratory for Composite Materials, Shanghai Jiao Tong University, Shanghai, 200240, Peop. Rep. China). Polymer Journal (Tokyo, Japan), 35(3), 280-285 (English) 2003. CODEN: POLJB8. ISSN: 0032-3896. Publisher: Society of Polymer Science, Japan.
- AB Prepn. of arenesulfonated hyperbranched polyimide (S-HBPI) from 4,4'-(hexafluoroisopropylidene)diphthalic anhydride (6FDA) and 1,3,5-tris(4-aminophenoxy)benzene (TAPOB) was reported. Sulfonation of the polymer was directly fulfilled during the course of polymn. of poly(amic acid) precursor, by modification of the terminal anhydride groups with sulfanilic acid, and then the precursor was chem. imidized in the presence of acetic anhydride and triethylamine.
- IT **481711-24-4DP**, 4,4'-(Hexafluoroisopropylidene)diphthalic anhydride 1,3,5-tris(4-aminophenoxy)benzene copolymer, reaction product with sulfanilic acid  
(prepn. of **arenesulfonated** hyperbranched polyimide from A2 + B3 monomers)
- RN 481711-24-4 ZCAPLUS
- CN 1,3-Isobenzofurandione, 5,5'-[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis-, polymer with 4,4',4'-'-[1,3,5-benzenetriyltris(oxy)]tris[benzenamine] (9CI) (CA INDEX NAME)

CM 1

CRN 102852-92-6

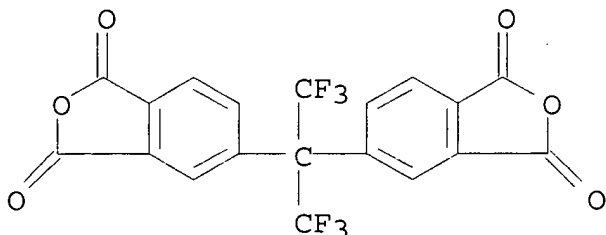
CMF C24 H21 N3 O3



CM 2

CRN 1107-00-2

CMF C19 H6 F6 O6



CC 35-5 (Chemistry of Synthetic High Polymers)

Section cross-reference(s): 38

IT 121-57-3DP, Sulfanilic acid, reaction product with  
 4,4'-(hexafluoroisopropylidene)diphthalic anhydride  
 1,3,5-tris(4-aminophenoxy)benzene copolymer **481711-24-4DP**,  
 4,4'-(Hexafluoroisopropylidene)diphthalic anhydride  
 1,3,5-tris(4-aminophenoxy)benzene copolymer, reaction product with  
 sulfanilic acid  
 (prepn. of **arenesulfonated** hyperbranched polyimide from  
 A2 + B3 monomers)

L21 ANSWER 4 OF 6 ZCAPLUS COPYRIGHT 2003 ACS on STN

2002:624808 Document No. 137:279585 Homogeneous synthesis and  
 characterization of sulfonated poly(arylene ether sulfone)s via  
 chlorosulfonic acid. Harrison, William L.; O'Connor, K.; Arnett,  
 N.; McGrath, J. E. (Virginia Tech Chemistry Dept., Virginia Tech.,  
 Blacksburg, VA, 24061, USA). Polymer Preprints (American Chemical

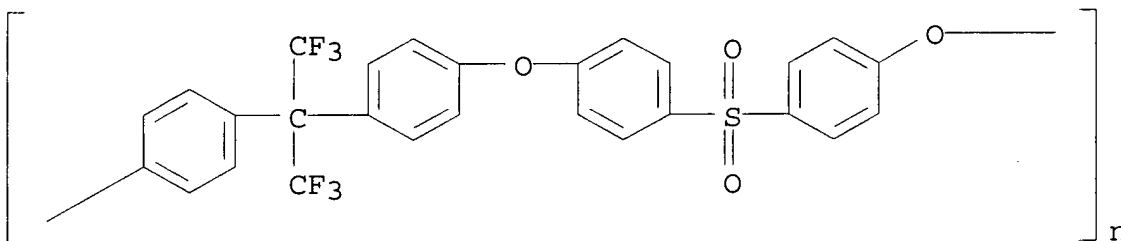
Society, Division of Polymer Chemistry), 43(2), 1159 (English) 2002.  
CODEN: ACPAY. ISSN: 0032-3934. Publisher: American Chemical Society, Division of Polymer Chemistry.

AB Poly(arylene ether sulfone)s, based on hexafluorobisphenol A or 4,4'-biphenol both polymd. with stoichiometric amt. of 4,4'-dichlorodiphenylsulfone, were sulfonated using chlorosulfonic acid/chlorotrimethylsilane system.

IT **31694-07-2DP**, Bis(4-chlorophenyl) sulfone-4,4'-(hexafluoroisopropylidene)bisphenol copolymer, sru, **sulfonated 90884-65-4DP**, Bis(4-chlorophenyl) sulfone-4,4'-(hexafluoroisopropylidene)bisphenol copolymer, **sulfonated** (synthesis and characterization of **sulfonated** poly(arylene ether sulfone)s via chlorosulfonic acid)

RN 31694-07-2 ZCAPLUS

CN Poly[oxy-1,4-phenylenesulfonyl-1,4-phenyleneoxy-1,4-phenylene[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]-1,4-phenylene] (9CI) (CA INDEX NAME)



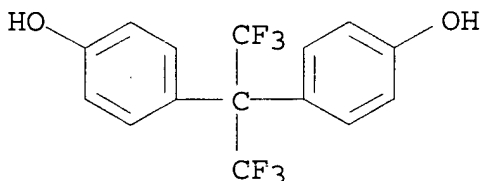
RN 90884-65-4 ZCAPLUS

CN Phenol, 4,4'-[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis-, polymer with 1,1'-sulfonylbis[4-chlorobenzene] (9CI) (CA INDEX NAME)

CM 1

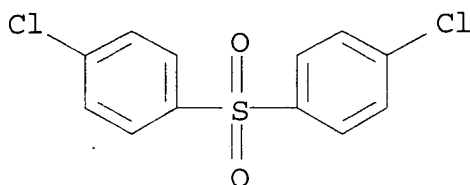
CRN 1478-61-1

CMF C15 H10 F6 O2



CM 2

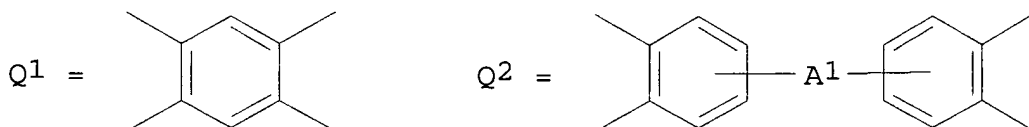
CRN 80-07-9  
CMF C12 H8 Cl2 O2 S



CC 35-8 (Chemistry of Synthetic High Polymers)  
IT 25608-64-4DP, 4,4'-Biphenol-4,4'-dichlorodiphenylsulfone copolymer, sulfonated 25839-81-0DP, sulfonated **31694-07-2DP**, Bis(4-chlorophenyl) sulfone-4,4'-(hexafluoroisopropylidene)bisphenol copolymer, sru, **sulfonated 90884-65-4DP**, Bis(4-chlorophenyl) sulfone-4,4'-(hexafluoroisopropylidene)bisphenol copolymer, **sulfonated** (synthesis and characterization of **sulfonated** poly(arylene ether sulfone)s via chlorosulfonic acid)

L21 ANSWER 5 OF 6 ZCAPLUS COPYRIGHT 2003 ACS on STN  
2002:61649 Document No. 136:142605 Photosensitive polyamide and the polyamide composition for electronic device fabrication. Nishikawa, Masato; Sakamoto, Ko (Clariant Japan K. K., Japan; Asahi Chemical Industry Co., Ltd.). Jpn. Kokai Tokkyo Koho JP 2002020484 A2 20020123, 9 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2000-213041 20000713.

GI



AB The polyamide is that represented as  $XCO[NHX1(OD)2NHC(O)X2C(O)]_a[NHX3NHC(O)X2C(O)]_bNHX1(OD)2NHCOZ$  [I; X1 = tetravalent group Q1, Q2; A1 = direct bond, O, O(CF3)2, CO, SO2; X2 = C6H4, C6H4A2C6H4; A2 = direct bond, O, C(CF3)2, CO, SO2; X3 = divalent org. group; a + b = 100; a = 60.0-100; b = 0-40.0; .ltoreq.50% pf D is 1,2-naphthoquinonediazido-4-sulfonate ester residue or 1,2-naphthoquinonediazido-5-sulfonate ester residue and the rest is H; Z = aliph., alicyclic, or arom. group substituted with .gtoreq.1 alkenyl or alkynyl]. The compn. contg. I is suitable for photolithog. showing high sensitivity and high contrast to give surface-protecting film or intermediate elec. insulator film in semiconductor device, etc.

IT **112492-60-1DP**, 5-norbornene-2,3-dicarboxylic

acid-terminated, 1,2-naphthoquinonediazido-4 or 5-sulfonate  
 ester **123349-56-4DP**, 5-norbornene-2,3-dicarboxylic  
 acid-terminated, 1,2-naphthoquinonediazido-4-sulfonate  
 ester

(photosensitive polyamide for photolithog. in electronic device  
 fabrication)

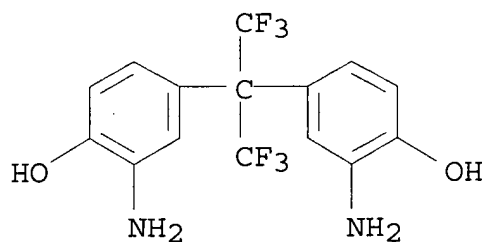
RN 112492-60-1 ZCAPLUS

CN Benzoic acid, 4,4'-oxybis-, polymer with 4,4'-[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis[2-aminophenol] (9CI) (CA INDEX NAME)

CM 1

CRN 83558-87-6

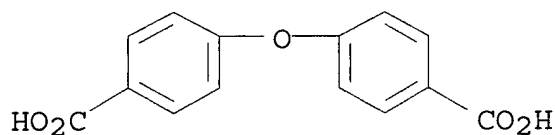
CMF C15 H12 F6 N2 O2



CM 2

CRN 2215-89-6

CMF C14 H10 O5



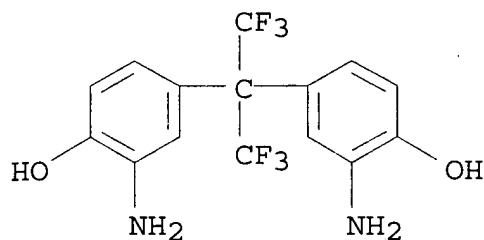
RN 123349-56-4 ZCAPLUS

CN 1,3-Benzenedicarboxylic acid, polymer with 1,4-benzenedicarboxylic acid and 4,4'-[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis[2-aminophenol] (9CI) (CA INDEX NAME)

CM 1

CRN 83558-87-6

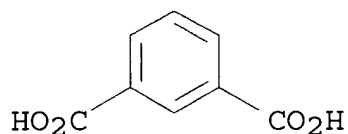
CMF C15 H12 F6 N2 O2



CM 2

CRN 121-91-5

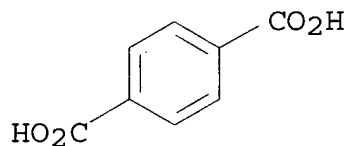
CMF C8 H6 O4



CM 3

CRN 100-21-0

CMF C8 H6 O4



- IC ICM C08G069-26  
ICS C08G069-48; C08L077-06; G03F007-023; G03F007-037; H01L021-027
- CC 74-4 (Radiation Chemistry, Photochemistry, and Photographic and Other Reprographic Processes)  
Section cross-reference(s): 38, 76
- IT 85-44-9DP, Phthalic anhydride, reaction products with polyamide 826-62-0DP, 5-Norbornene-2,3-dicarboxylic anhydride, reaction products with polyamide **112492-60-1DP**, 5-norbornene-2,3-dicarboxylic acid-terminated, 1,2-naphthoquinonediazido-4 or 5-**sulfonate** ester **123349-56-4DP**, 5-norbornene-2,3-dicarboxylic acid-terminated, 1,2-naphthoquinonediazido-4-**sulfonate** ester 391859-90-8P, 3,3'-Diamino-4,4'-dihydroxydiphenylhexafluoropropane-(4,4'-diphenyl ether)dicarboxylic



acid copolymer, sru, 5-norbornene-2,3-dicarboxylic anhydride-terminated, ester with 1,2-naphthoquinonediazido-4-sulfonyl chloride 391859-91-9P, 3,3'-Diamino-4,4'-dihydroxydiphenylhexafluoropropane-isophthalic acid-terephthalic acid copolymer, sru, 1,2-naphthoquinonediazide-4-sulfonate 391859-92-0P, 3,3'-Diamino-4,4'-dihydroxydiphenylhexafluoropropane-(4,4'-diphenyl ether)dicarboxylic acid copolymer, sru, 5-norbornene-2,3-dicarboxylic anhydride-terminated, ester with 1,2-naphthoquinonediazide-5-sulfonyl chloride 391859-93-1P, 3,3'-Diamino-4,4'-dihydroxydiphenylhexafluoropropane-(4,4'-diphenyl ether)dicarboxylic acid copolymer, sru, phthalic anhydride-terminated, 1,2-naphthoquinonediazide-4-sulfonate (photosensitive polyamide for photolithog. in electronic device fabrication)

L21 ANSWER 6 OF 6 ZCAPLUS COPYRIGHT 2003 ACS on STN

1994:90539 Document No. 120:90539 Photoreactive fluorinated polyimide protected by tetrahydropyranyl (THP) group based on chemical amplification: acid generation in polyimide film and lithographic properties. Naitoh, Kazuhiko; Ishii, Kazuhisa; Yamaoka, Tsuguo; Omote, Toshihiko (Fac. Eng., Chiba Univ., Chiba, 263, Japan). Polymers for Advanced Technologies, 4(4), 294-301 (English) 1993. CODEN: PADTE5. ISSN: 1042-7147.

AB The photochem. of photoacid generator (PAG), diphenyliodonium 9,10-dimethoxyanthracene-2-sulfonate (DIAS) and diphenyliodonium 8-anilidonaphthalene-1-sulfonate (DIANS) was investigated in both alk.-sol. polyimide (6FDA-AHHFP) prep'd. from [trifluoro(trifluoromethyl)ethylidene]bis(isobenzofurandione) and bis(aminohydroxyphenyl)hexafluoropropane, and in novolak films. The quantum yields of photodisocn. of DIAS and DIANS in both 6FDA-AHHFP and novolak films were 0.11, 0.21, 0.12 and 0.26, resp. The quantum yields for acid generation from DIAS and DIANS in both of these films were 0.07, 0.18, 0.09 and 0.22, resp. The values of the quantum yields of photodisocn. and photoacid formation for DIAS and DIANS in 6FDA-AHHFP film are lower than those in novolak films. Fluorescence quenchings of sodium 9,10-dimethoxyanthracene-2-sulfonate and ammonium 8-anilidonaphthalene-1-sulfonate by a model comp'd. of polyimide was carried out in acetonitrile. The fluorescences of these two salts were efficiently quenched by the model comp'd. with the diffusion-controlled rate const. in acetonitrile, suggesting that a strong electron-accepting capability of the imide carbonyl group may hinder the electron transfer process within PAC mols. in 6FDA-AHHFP film. Although a polyimide (6F-THP) protected by tetrahydropyranyl group is insol. in aq. base, 6F-THP film contg. PAG became sol. in a 2:1 mixt. of 2.0 wt.% tetramethylammonium hydroxide (TMAH) and methanol by exposure to 365 nm light and successive post-exposure baking (PEB) at 120.degree. for 10 min. The sensitivity and contrast 6F-THP with DIANS after the PEB conditions above were 110 mJ/cm<sup>2</sup> and 3.7, resp. A high-resoln. pattern with a good profile was transferred into the 3 .mu.m thickness of the 6F-THP film.

IT 121333-85-5D, reaction products with 3,4-dihydro-2H-pyran

121334-09-6D, reaction products with 3,4-dihydro-2H-pyran  
(lithog. performance of photoresist system contg.  
**anilinonaphthalenesulfonate** and)

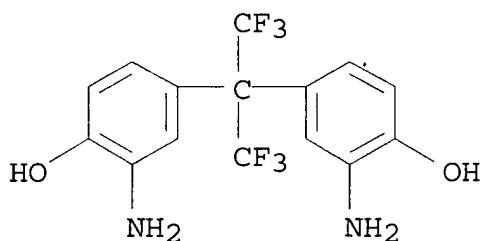
RN 121333-85-5 ZCAPLUS

CN 1,3-Isobenzofurandione, 5,5'-[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis-, polymer with 4,4'-[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis[2-aminophenol] (9CI) (CA INDEX NAME)

CM 1

CRN 83558-87-6 .

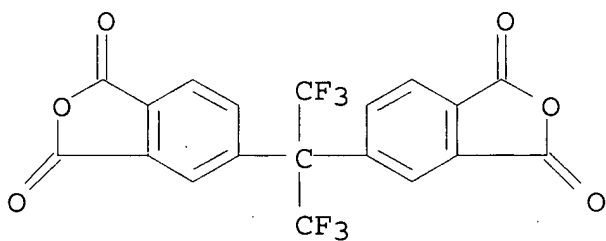
CMF C15 H12 F6 N2 O2



CM 2

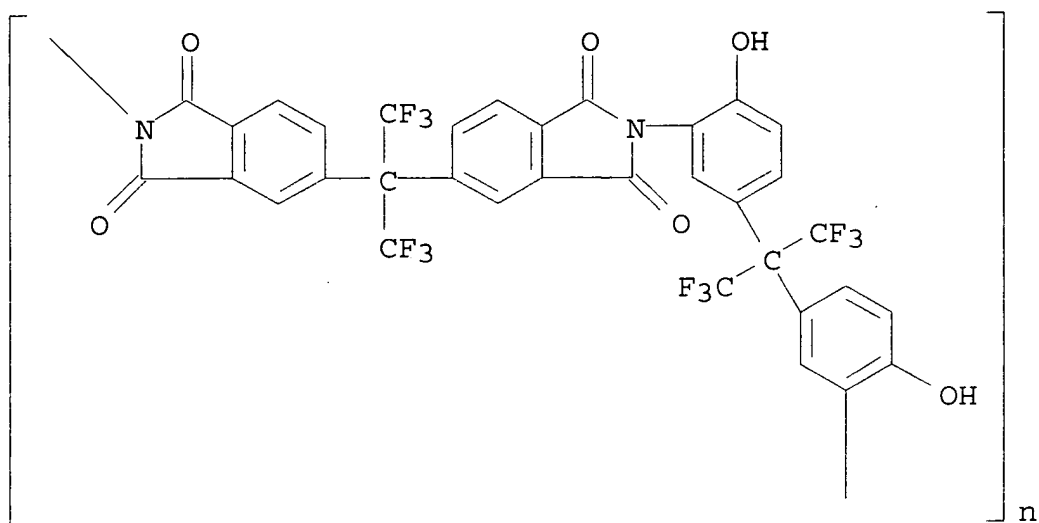
CRN 1107-00-2

CMF C19 H6 F6 O6



RN 121334-09-6 ZCAPLUS

CN Poly[(1,3-dihydro-1,3-dioxo-2H-isoindole-2,5-diyl) [2,2,2-trifluoro-1-(trifluoromethyl)ethylidene] (1,3-dihydro-1,3-dioxo-2H-isoindole-5,2-diyl) (6-hydroxy-1,3-phenylene) [2,2,2-trifluoro-1-(trifluoromethyl)ethylidene] (4-hydroxy-1,3-phenylene)] (9CI) (CA INDEX NAME)



- CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other Reprographic Processes)  
 Section cross-reference(s): 76
- IT 110-87-2D, reaction products with polymer 6FDA-AHHFP  
 121333-85-5D, reaction products with 3,4-dihydro-2H-pyran  
 121334-09-6D, reaction products with 3,4-dihydro-2H-pyran  
 (lithog. performance of photoresist system contg.  
**anilinonaphthalenesulfonate** and)